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JOURNAL OF EDUCATIONAL RESEARCH

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JOURNAL *of* EDUCATIONAL RESEARCH

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OCCUPATIONAL DIAGNOSES FOR EDUCATIONAL PROGRAMS

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THE Thirty-fourth Yearbook of the National Society for the Study of Education marks a significant step forward in the development of educational tools and techniques. Every improvement in technical instruments reveals, however, the presence of important problems which had previously gone unnoticed. In presenting this discussion of educational diagnosis, it seems important to point out that there are some really serious dangers confronting us if we adopt these keener educational tools without modifying our time-honored educational habits and programs in directions clearly indicated by facts already known and theories now commonly accepted.

All of us accept the theory of individual differences, for example. We can all demonstrate conclusively the tremendous range of abilities, aptitudes, interests, and personal traits possessed by the pupils in any given classroom. There are relatively few schools, however, that are actually providing significantly for those differences in the practical needs of pupils made evident by their measured differences in characteristics. We continue to require in the elementary grades a uniform set of subjects to be studied by all pupils. In some states pupils are actually required to pass a uniform set of objective subject-matter tests in order to be graduated and admitted to high school. Similar types of uniform programs and requirements prevail in high schools and colleges, in spite of our universal lip service to theory and research in individual differences.

Typical American educational practice attempts consistently to iron out and to eliminate individual differences. As soon as objective tests were devised for measuring such differences, earnest teachers and supervisors began to prod and annoy those pupils who were "below standard" in their test scores. When more precise tests were developed, these same "modern educators" began to administer programs of "diagnostic testing and remedial teaching," but without changing the uniform character of the

required educational program. Those pupils who were "above standard achievement" in a given subject were either ignored or given extra drills and assignments in those other subjects in which they were "below standard."

An irregular profile of achievement for a given pupil seemed automatically to set off spontaneous efforts by teachers and supervisors to take the child's attention away from the subjects in which he could do well and to center his efforts on those subjects in which he could not do well. I am now very much disturbed lest the improved diagnostic devices described in the Thirty-fourth Yearbook may likewise be adopted by thousands of schools as clever devices for increasing the effectiveness of this unnatural and perhaps socially undesirable campaign to eliminate individual differences and to reduce all pupils to a dead level of colorlessness and mediocrity.

Do not misunderstand me! I am as enthusiastic as anyone about the great possibilities for educational progress opened up by the development of these improved instruments and techniques for making individual diagnoses. But I am vigorously opposed to the prevailing tendency to make every pupil just like every other pupil, and to make each pupil equally mediocre in every subject. Biologists have called our attention to the great pains taken by nature to produce wide differences in the characteristics of individuals; and a few minutes given to the observation of life around us will convince any intelligent person that the modern highly-organized world is interested in, and is ready to reward, not the "all around jack-of-all-trades," but the individual who differs from the common herd. No one but the school teacher now offers prizes for "all around development" in human beings. In pioneer America, the self-contained, self-sufficient jack-of-all-trades was greatly needed, but the modern world demands and pays for distinctiveness and for special talents.

Research findings in the psychology of learning are also opposed to this leveling program of the academic pedagogue. It is perfectly normal for every child to crave attention to himself as a distinctive and outstanding individual. The normal way to gain applause from one's fellows is by the excellence of one's special contribution to the community life. One really learns to do a given task by doing it "under his own steam" and then feeling the satisfaction of having done the task effectively and of having gained thereby the approval of those about him. When a teacher begins to frown upon the unusually excellent performances of her pupils and to remind each one constantly of the points in which he is weak and

ineffective, she becomes practically useless as a factor in the learning process. She is strong only when she works in harmony with the law of effect, reinforcing the satisfactions that follow successful achievements.

The chief arguments advanced in favor of uniform curricula with uniform levels of achievement have been almost entirely economic in character: the advantages of mass production and inter-changeable parts. It has been claimed, however, that it is not possible in the early college years, or during high school days, or in the elementary grades to determine the occupational field into which a given student will go later as an adult, and that he should therefore not be allowed to become specialized. In the effort to avoid early occupational specialization, we have actually set up a single occupational field—the professional academic field—and have required everyone to take training for it. If this uniform training were for some vocational field into which ninety or ninety-five percent of the pupils actually go later in life, there might be some justification for setting it up as a monopolistic program. But only a small percentage (6.7 percent) of these pupils who are required to take this uniform preliminary training actually remain in the professional field during adult life.

In holding all boys and girls to a uniform school program leading directly toward academic professional life, we pretend that occupational guidance is not being given. Nothing is farther from the truth, however. Almost every teacher in our typical academic school holds up before her pupils, either intentionally or unintentionally, the idea that ordinary every-day jobs are relatively undignified, and that the "learned professions" are the only occupations really worthy of attracting "the best people." When intentional educational guidance is given to the pupils who are ready to enter a high school, teachers usually suggest an academic pre-professional course for pupils who have done well, and a manual training or vocational course for pupils who have not done well in the lower grades. A large majority of our elementary school pupils will, as adults, actually have to do ordinary routine jobs, and the snobbish attitudes that are being built up toward such work by the academic minds teaching in our schools is most unfortunate.

We should stop claiming that the public school is not directly concerned with the pupil's future occupation. The two relationships which are likely to mean most in determining the amount of success or failure in the adult life of each pupil are his relationship to his occupation and his relationship to his wife and family. Why should the school continually pretend to be neutral in the matter of occupations, when as a matter

of fact it still demands of everyone a type of training in which success can crown the efforts of only those few who are equipped by nature to enter a narrow band of professional occupations? Our uniform academic programs are not only unfair to the majority of our children, but, to the extent that they create artificial social distinctions between those who did and those who did not go on through school, they are positively injurious to our social order.

Let us, by all means, use these improved diagnostic tools discussed in the Thirty-fourth Yearbook as practical instruments for learning more about the individual pupils in our classes. Let us study thoroughly the characteristics of successful adult workers in different fields by means of similar diagnostic tests. And then let us help these boys and girls to compare their own traits and aptitudes with those that have been found in these adult workers, so that they may begin planning their occupational lives with reasonable hope of success. The beneficial effects upon school work will be obvious. Studying a topic or practicing a skill, because the pupil knows it will be needed all through his adult life, is a far more promising educational situation than studying this same topic or practicing this same skill because the teacher or the uniform curriculum requires it.

In this connection I should like to emphasize the necessity for a distinct change in social attitudes among our teachers. The problems of youth cannot be solved by the forces of academic education working alone. The planning of a life is not a matter of educational guidance only. A human being, whether a youth or an adult, is a single biological organism. Socially desirable guidance of an individual involves his entire being, rather than his mental abilities only. Educational diagnosis cannot be safely separated from physical diagnosis, occupational diagnosis, and emotional diagnosis. Educational guidance cannot wisely be divorced from vocational guidance, social guidance, recreational guidance, and economic guidance. We in the field of education must give up our tendencies to assume a "holier than thou" attitude toward other social forces, organizations, and programs. For the sake of the success of our children, we must organize definitely to coöperate with entertainment and recreational organizations, public employment offices, local production industries, and the like. After all, our teachers know only a limited amount, at best, about the work-a-day life their pupils must be prepared to live outside their classrooms.

One of the most difficult teacher attitudes to change is that which looks upon occupations requiring strong academic abilities as superior in social

dignity and general desirability to those requiring high mechanical skills or great physical strength. We who deal in our classrooms with abstract symbols and philosophical ideas tend to glorify those jobs that involve our own special types of abilities and to look down upon the physical labor, personal service, and semi-skilled factory jobs by which the great majority of our public school pupils will certainly have to earn their living. This is unfair, undemocratic, and anti-social. Unless we change these attitudes, teachers are going to use the splendid instruments for educational diagnosis described in this yearbook as additional devices for making our future citizens feel that life has cheated them.

Let us plan to use these more accurate measuring instruments as devices for helping our pupils to understand themselves and their own richest opportunities in life, rather than as devices for glorifying still further a small group of academic professions as the only really worth-while occupations. Let us make the most complete diagnosis possible of each individual pupil, and then let us provide for that pupil those appropriate types of educational activities which will build upon his interests and his strengths rather than plague him about his weaknesses.

Even if it were possible to do so, it would be highly undesirable and anti-social to force everyone through the same educational mould into the same group of occupations. Let us develop the idea that the only social stigma attached to a person's working at any type of necessary occupation would be the fact that he was qualified to make a greater contribution to society by working in some entirely different occupation. This does not mean that pupils should be classified occupationally once and for all by the schools. That would be impossible. It does mean, however, that by the use of the diagnostic tests now available we should determine the special strengths and weaknesses of our individual pupils, and then give each of them intelligent assistance in preparing himself to be successful and happy in adult vocational life. In order to do this, we must recognize in our school programs, as well as in our textbooks on education, the reality and the vital importance of individual differences in our pupils. Occupational diagnosis must be recognized as a fundamental part of any diagnosis that is being made as a basis for the planning of an individual's educational program.

FACTORS AFFECTING THE COST OF PUPIL TRANSPORTATION[1]

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A study of factors affecting the cost of pupil transportation in Arkansas shows that the length of the bus route, the number of pupils transported, the cost (new) of the bus, and the kind of bus drivers, are the most important determinants of cost. The data from which these conclusions are drawn were secured from 261 Arkansas districts receiving state aid for pupil transportation in 1930-31. The cost of transportation was estimated for 355 school-owned and 393 contract buses operating in these districts, from itemized statements of cost submitted to the State Department of Education, and from other data secured from the districts by correspondence and visitation. The following factors taken from twelve representative studies in pupil transportation were selected for analysis: *Factors relating to pupils:* Number of pupils transported per year, number of pupils transported per bus per load, number transported per bus per day, and number of pupil miles; *Factors relating to bus routes:* Type of road, length of bus route, number of bus routes per bus, number of round trips per day, and bus mileage per year; *Factors relating to buses:* Days operated per year, seating capacity, ownership, make, cost, and age; *Factors relating to bus drivers:* Age and vocation; *Factors relating to school districts:* Topography, area, current expense of school, salary of superintendent, purchasing policies and years transportation has been furnished.

The selection of a unit of measurement for comparing pupil transportation projects involves no small amount of difficulty because of the tendency for units of measurement to increase rather than reduce the variability of costs. Evans[2] has shown that the cost per bus per day is the most satisfactory basis for attempting to standardize cost; and this value is used primarily in this study. Other unit costs, however, such as the cost per bus mile, pupil mile and pupil per day, are shown for comparative purposes.

An analysis of the factors relating to the pupils shows that the number transported per day has an important effect on the cost of transportation

[1] Research Paper 359, Journal Series, University of Arkansas. The data of this study are from a thesis by the writer entitled "Estimating the Cost of Pupil Transportation in Arkansas." Cornell University Library, Ithaca, New York, 1934.

[2] Evans, F. O. *Factors Affecting the Cost of School Transportation in California.* Bulletin No. 29, 1930. U. S. Office of Education.

(Table I). The cost per bus per day for contract transportation is less for smaller loads and more for larger loads than the cost of school-owned transportation. This is probably due to the fact that the bids for contract transportation are based on the number of pupils transported, whereas the cost of school-owned transportation is a summation of operation costs, maintenance, fixed charges and capital costs such as depreciation and interest. These items of cost do not change in proportion to changes in the number of pupils transported.

The cost per bus per day is less for dirt roads than for routes having some paved or gravel mileage, and increases with an increase in the total

TABLE I

RELATION OF NUMBER OF PUPILS TRANSPORTED PER DAY TO COST OF PUPIL TRANSPORTATION, 748 BUSES, 1930-31

Pupils transported per bus per day	School-owned transportation			Contract transportation		
	Number of buses	Average cost per bus per day	Aggregate number transported per bus per year	Number of buses	Average cost per bus per day	Aggregate number transported per bus per year
		Dollars	Pupils		Dollars	Pupils
Less than 20	15	3.50	2,665	61	2.30	1,951
20 – 29	66	4.02	3,792	86	3.96	3,723
30 – 39	88	4.11	5,341	100	4.64	5,198
40 – 49	76	4.48	6,679	71	5.29	6,724
50 – 59	40	4.40	8,030	38	6.05	8,106
60 – 69	36	4.76	9,413	24	7.32	9,248
70 – 79	13	5.32	9,774	9	7.39	9,943
80 – 89	8	5.38	11,643	3	6.46	9,129
90 – 99	5	5.90	13,312	1	7.96	15,004
100 or more	9	5.98	15,179	0		

route mileage for each type of road (Table II). The cost per bus mile and per pupil mile are less for the paved and gravel routes than for the dirt and decrease with an increase in mileage. Buses operating over dirt roads only travel fewer miles and transport fewer pupils. These data are difficult to interpret because of the interaction of the mileage and pupil factors. The fact that the cost per pupil mile and per bus mile are dependent on the number of pupils transported and miles traveled, offers some explanation for the extremely high unit cost in the "dirt" group. It is not possible from these data to definitely attribute any change in cost to construction of road, and it is clear that if the type of road has any effect on cost of transportation, this effect is small compared to that of pupils transported or miles traveled.

The average cost per bus mile and per pupil, decrease as the length of the haul for school-owned buses increases (Table III). The contract buses, on the contrary, show the effect of the contract bids in an increased cost per pupil per day as the length of the bus route increases. The number of pupils per bus per day increases with the cost of transportation, indicating the interrelation of the mileage and pupil factors.

Some buses make a practice of traveling empty to the end of the route farthest from the school building and gathering the pupil load on the return trip. This procedure necessitates four one way trips per bus per day—two loaded and two empty. The cost of transportation is increased about 35 cents per bus per day for buses making these extra trips (Table IV). The cost per bus mile and per pupil mile show small increases in both

TABLE II

RELATION OF TYPE OF ROAD AND ROUTE MILEAGE TO COST OF PUPIL TRANSPORTATION, 355 SCHOOL-OWNED BUSES, 1930-31

Type of road	Route mileage per bus one way for type of road indicated	Average length of bus route one way	Average number transported per bus per day	Cost of transportation		
				Per bus per day	Per bus mile	Per pupil mile
		Miles	Pupils	Dollars	Cents	Cents
Paved	Less than 4.5	11	46	4.35	20	.4
	4.5 – 8.4	13	46	4.58	18	.4
	8.5 – 12.4	13	56	4.56	18	.3
	12.5 or more	23	65	6.14	13	.2
Grave	Less than 4.5	11	48	4.25	20	.4
	4.5 – 8.4	12	40	4.37	19	.5
	8.5 – 12.4	14	59	4.92	19	.3
	12.5 or more	20	46	4.53	12	.3
Dirt	Less than 4.5	3	30	3.46	47	1.6
	4.5 – 8.4	6	32	3.90	30	.9
	8.5 – 12.4	11	43	4.49	22	.5
	12.5 or more	17	32	4.53	14	.4

TABLE III

RELATION OF ROUTE MILEAGE ONE WAY TO COST OF PUPIL TRANSPORTATION, 748 BUSES, 1930-31

Route mileage per bus one way	School-owned transportation			Contract transportation		
	Average number transported per bus per day	Transportation cost		Average number transported per bus per day	Transportation cost	
		Per bus mile	Per pupil per day		Per bus mile	Per pupil per day
	Pupils	Cents	Cents	Pupils	Cents	Cents
Less than 4.5	26	50	15	18	30	11
4.5 – 9.4	36	27	11	34	29	12
9.5 – 14.4	45	19	10	40	24	13
14.5 – 19.4	49	15	10	46	19	14
19.5 or more	58	12	9	43	6	16

TABLE IV

RELATION OF NUMBER OF ROUND TRIPS PER BUS PER DAY TO COST OF PUPIL TRANSPORTATION, 748 BUSES, 1930-31

Round trips per bus per day	School-owned transportation			Contract transportation		
	Average cost per bus per day	Average cost per bus mile	Average cost per pupil mile	Average cost per bus per day	Average cost per bus mile	Average cost per pupil mile
Number	Dollars	Cents	Cents	Dollars	Cents	Cents
1	4.11	19	.5	4.57	22	.6
2	4.46	23	.6	4.26	26	.7

contract and school-owned buses with the tendency for the ratio of increase to be slightly more for school-owned buses.

An analysis of the factors relating to the school buses shows that the cost of transportation per bus per day decreases up to 140 days per year, but that the number of days the bus operates in excess of 140 days per

TABLE V

RELATION OF SEATING CAPACITY TO NUMBER OF PUPILS TRANSPORTED AND COST OF PUPIL TRANSPORTATION, 249 SCHOOL-OWNED BUSES, 1930-31

Seating capacity per bus	Average number transported per bus		Average length of bus route one way	Cost of transportation		
	Per day	Largest load per day		Per bus per day	Per pupil per day	Per pupil mile
	Pupils	Pupils	Miles	Dollars	Cents	Cents
20 – 29	22	22	10	3.66	17	.9
30 – 39	39	29	10	4.35	11	.6
40 – 49	44	34	12	4.46	10	.5
50 – 59	45	33	9	4.03	9	.6
60 – 69	46	40	12	4.44	10	.5

TABLE VI

RELATION OF THE COST (NEW) OF BUS TO COST OF PUPIL TRANSPORTATION, 355 SCHOOL-OWNED BUSES, 1930-31

Cost (new) of bus and body	Number of buses	Average number transported per bus		Cost of transportation		
		Per day	Largest load per day	Per bus per day	Per bus mile	Per pupil mile
Dollars		Pupils	Pupils	Dollars	Cents	Cents
Less than 700	12	33	32	3.34	19	.6
700 – 799	24	39	34	3.65	14	.4
800 – 899	58	38	33	3.86	18	.5
900 – 999	54	49	36	4.03	16	.3
1,000 – 1,099	97	44	33	4.40	17	.5
1,100 – 1,199	55	42	32	4.69	21	.5
1,200 – 1,299	25	43	36	5.04	21	.5
1,300 or more	30	56	40	5.97	26	.5

year has little effect on the cost per day. The seating capacity is remotely related to the transportation cost (Table V), because of the low correlation (.01) between seating capacity and cost (new) of the bus. Since the charge for depreciation represents about one-third the cost of pupil transportation and is based on the cost (new) of the bus, obviously the capacity of the bus and cost of transportation are not closely related.

School-owned buses operate at a cost per bus per day of $4.39 as compared to $4.66 for contract. No important relation was found between the make of the bus and the cost of pupil transportation, but a high degree of relationship was found between the cost (new) of the bus and the cost of pupil transportation. The number of pupils transported per bus per day changes from 35 to 56 when the cost of the bus changes from less than $700 to $1300 or more (Table VI). The changes in the number of pupils transported are irregular and indicate as a rule that medium priced buses transport more pupils per day than the higher priced ones.

About two-thirds of the school buses had been in use two years or less in 1930-31. There is a tendency after two years for the cost of operation to decrease as the age of the bus increases and this same tendency is noted in the salary of the bus driver. The maintenance charge tends to increase as the bus advances in age. The older buses are operated over shorter routes and this fact may account for the apparent decrease in cost. In any event, the number of buses operating three or more years is too small to justify any definite conclusions relative to the effect of age of bus on cost of transportation.

There is little relation between the age of the bus driver and the number of days operated, number of pupils transported, or number of miles the bus travels, but there is some tendency for school boards to pay higher salaries to older drivers of school-owned buses. School bus drivers are selected from pupils, patrons and teachers. Patron drivers of school-owned buses receive an average salary of $250 per annum, pupils $157, and teachers $189 (Table VII). There is little difference in the cost of gas, oil and maintenance for the three kinds of drivers, and the patron drivers operate over one-way route mileages averaging one mile longer than those of the teacher drivers.

The data on factors classified under the school districts offer little evidence to indicate that the cost of transportation is materially affected by the topography of the area, the number of square miles in the district, the salary of the superintendent, the annual current expense of the school, or

the years transportation has been furnished. The tabular data indicate a small saving in cost due to wholesale purchasing of supplies.

The analyses show that five factors—route mileage, pupils transported per bus per day, cost (new) of the bus, occupation of bus driver, and purchase of supplies—have a noticeable effect on the cost of pupil transportation.

TABLE VII

RELATION OF OCCUPATION OF DRIVER TO COST OF OPERATION AND MAINTENANCE OF TRANSPORTATION, 355 SCHOOL-OWNED BUSES, 1930-31

Occupation of bus driver	Average cost per bus per year				Average length of bus route one way
	Salary of bus driver	Gas and oil	Maintenance	Total cash outlay	
	Dollars	Dollars	Dollars	Dollars	Miles
Patron	250	131	63	451	12
Pupil	157	129	61	357	12
Teacher	189	131	56	381	11

tion. A statistical analysis of these factors was made to determine the significance of the obtained differences in cost per bus per day for the frequency groupings tabulated for each factor.[3] The analysis shows that the differences found in all distributions except that of purchase of supplies are highly significant; and that the differences obtained in the "purchase of supplies" distribution are due to chance.

SUMMARY

The purpose of this study is a determination of the more important factors having a significant effect on the cost of pupil transportation. The cost data were secured from 261 Arkansas consolidated districts receiving state aid for pupil transportation in 1930-31. The number of pupils transported affects the cost of pupil transportation and this effect is more marked in contract than in school-owned buses. The data show little difference in cost for different types of roads. An important relation is found between route mileage one way and cost of transportation, and this relationship is more apparent in school-owned than in contract buses.

The number of days in excess of 140 has little or no effect on the cost per bus per day, but there is a sharp increase in daily cost for buses operating less than 140 days. School-owned buses are less expensive to op-

[3] Fisher's method of analysis of variance is used for the statistical treatment of the results reported in this paper. This method facilitates the isolation of factors and provides an appropriate test of significance. Snedecor, in his Calculation and Interpretation of the Analysis of Variance and Co-Variance (Collegiate Press, Ames, Iowa, 1934) has furnished simply explained and efficient methods of computation.

erate than contract, and the make, age and seating capacity of the bus, bear little or no relation to cost of transportation, but the cost (new) of the bus has an important effect on the transportation cost.

The age and occupation of the bus driver affects the cost of transportation through differences in salary paid to operators. Older drivers of school-owned buses are paid more than younger ones, and patrons receive more than teachers or pupils. Such factors as topography, area, current expense of district, purchasing of supplies and years the district has furnished transportation, show no important relation to cost of pupil transportation.

The most important factors found to have a significant effect on the cost of pupil transportation are the two managerial factors—cost of bus and occupation of bus driver—and the two factors over which school authorities have little control—the length of the bus route and the number of pupils transported per bus per day.

A COMPARISON OF FIVE TYPES OF SPELLING TESTS FOR DIAGNOSTIC PURPOSES

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THE spelling ability of school children is often determined for diagnostic purposes on the basis of one application of either an oral or written test. The assumption is that if a pupil can spell a word correctly under one type of situation, for example in a written list form of test, he can spell the word correctly under all situations. The converse, as applied to misspelling a word, is also believed to be true.

The purpose of this study was to investigate the variability of student performance on five different forms of spelling tests. Varying the test form was assumed as synonymous to varying the conditions under which the pupil is required to spell a word. If a pupil spells a word correctly when asked to do so orally, what assurance is there that he can spell the word equally well under different circumstances, such as in a timed dictation test? What type of a spelling test will yield the most valid results for diagnostic purposes? This paper will attempt to answer these and related questions.

Subjects.—The subjects for this study consisted of forty-three pupils in the sixth A grade, Tuttle School, Minneapolis.

Selection of words.—It was decided to select twenty words from *The Iowa Spelling Scales* by E. J. Ashbaugh.[1] It has been recommended that tests for measurement of spelling achievement should be not less than fifty words in length. The purpose of this study, however, was not to make an accurate measure of spelling ability, but rather to determine consistency of spelling under varying types of situations. With this purpose in view twenty words should be sufficient to meet the needs of this study. The twenty words were selected with two purposes in mind. One was to include words which would easily fit into a short connected story; the other was to include words of varying difficulty, some which practically all could spell correctly and some which only the best could spell. Approximately half of the twenty words were of fifty percent difficulty for average sixth graders, one-fourth of greater than fifty percent difficulty, and one-fourth of less than fifty percent difficulty. The words selected and

[1] Ashbaugh, E. J. *Iowa Spelling Scales.* Bloomington, Illinois: Public School Publishing Company, 1922.

their degree of difficulty as expressed in the percent of average pupils in the sixth grade spelling them correctly are given below:

ninety (54%)	orchestra (55%)
succeeded (54%)	occasionally (33%)
similar (54%)	convenience (23%)
nickel (51%)	exhibition (23%)
admission (50%)	schedule (9%)
carnival (50%)	arriving (63%)
appearance (51%)	various (59%)
excitement (50%)	humor (78%)
planned (45%)	Saturday (87%)
finally (44%)	island (93%)

Selection and construction of the tests.—The purpose of this study, as already mentioned, was to have the pupils spell the twenty selected words under as many controlled situations as possible. Five types of situations or tests were decided upon. These were story form, timed dictation, list form, multiple-choice, and oral form. A brief description of each type is given below.

1. *Story form.*—As the title suggests, the twenty words were worked into a short story, which follows:

All week we had *planned* to go to the *carnival* on *Saturday*. It seemed that the day would never come, but *finally* it did. Right on *schedule* that morning about *ninety* of us *succeeded* in crowding into the cars that had been provided for our *convenience* to take us to the *island*.

Everyone was in good *humor*. Upon *arriving* there we found *various* shows and many a fine *exhibition* to attract attention. For some of these the *admission* price was a *nickel*, but *occasionally* we found some that were free. The *appearance* of several clowns added greatly to the *excitement*. No two were *similar*.

There was much music, but we liked one *orchestra* better than the others.

2. *Timed dictation.*—The procedure used in constructing this test was the same as that described in Brueckner and Melby, *Diagnostic and Remedial Teaching*.[2] The completed form of this test consisted of twelve sentences. These, as well as the number of letters in each sentence, the time in seconds allotted to each sentence, and the position of the second hand at the moment each sentence was pronounced are:

[2] Brueckner, Leo J., and Melby, Ernest O. *Diagnostic and Remedial Teaching* (New York: Houghton Mifflin Company, 1931), pp. 385-387.

Position of second hand	Sentence	Number of letters	Time in seconds
60	A *nickel* was the *admission* price	27	28
28	On *Saturday* we *planned* a trip	24	25
53	The *island* was *ninety* miles wide	27	28
21	The *exhibition finally* began	25	26
47	The *orchestra* played *various* kinds of music	37	38
25	We saw the *schedule* of *arriving* trains	32	33
58	The *carnival* was *similar* to many others	33	34
32	Bad *humor* was *occasionally* shown	28	29
1	John *succeeded* in winning the prize	30	31
32	His *appearance* caused much laughter	31	32
4	The *excitement* was great	21	22
24	It was planned for the *convenience* of the people	40	41
5	Stop		

3. *List form.*—As in the traditional spelling test, the words were pronounced by the examiner and the pupils wrote.

4. *Multiple-choice.*—In order to obtain incorrect spellings which would not be artificial, the selected words were given to a group of sixth graders in another school. The four most common misspellings of each word were included with the correct spelling to make five possible choices for each word. These were mimeographed and a copy given to each pupil with the instructions to underscore the correct spelling of the twenty words, for example:

1. nintey, ninty, ninety, nintee, ninthey
2. succeeded, succeded, susseeded, suckseded, susceded

5. *Oral form.*—The pupils were taken aside individually and asked to spell the words. The exact spelling was recorded by the examiner.

Procedure.—Four of the tests, story form, timed dictation, list form, and multiple-choice, were administered one after the other in the order given on the same day, approximately thirty-five minutes being required to do this. The oral test was given the following day. This order of giving the tests was arbitrarily chosen as it appeared to the writer to be the one which would give the least practice effect. The writer administered and corrected the first four tests. He was assisted in giving the oral test by five others. This was done to prevent the testing process from consuming too much of the time of the class. In order to make the testing methods of the six examiners uniform, the following instructions were given: "Pronounce each word clearly and have the pupil pronounce the word after you. Be careful that the pupil does not detect the spelling from the printed list nor from your facial or tonal expression. As soon as the pupil has spelled the word, write it down exactly the way he spelled it."

RESULTS

It has been suggested that the validity of a diagnostic spelling test be based upon its difficulty. That is, a test on which the pupils made the

greatest number of errors is most valid. This is based upon the assumption that if a pupil knows a word he should be able to spell it correctly under all circumstances. When applying this criterion, it appears that the timed dictation test is most valid in that it was most difficult, the mean and mid-scores being lowest on this test. (Table I.) The mean score on the timed dictation test was 8.32 words correct as compared with 8.51 words on the story form, 10.02 words on the list form, 13.83 words on the multiple-choice, and 11.18 words on the oral form.

TABLE I

MEAN SCORES AND MID-SCORES MADE ON THE FIVE TYPES OF TESTS

Type of Test	Mean Score	Mid-Score
Story Form	8.51 words	8 words
Timed Dictation	8.32 words	7 words
List Form	10.02 words	10 words
Multiple-choice	13.83 words	14 words
Oral Form	11.18 words	10 words

In order to determine whether the differences between the means of the various tests are significant or not, the probable errors of the differences between means for correlated measures were calculated. These as well as the differences between the means and the ratios between the differences and their probable errors are given in Table II.

TABLE II

DIFFERENCES BETWEEN THE MEANS OF THE FIVE TESTS TOGETHER WITH THE PROBABLE ERRORS OF THE DIFFERENCE BETWEEN MEANS, CORRELATED MEASURES, AND THE RATIOS BETWEEN THE TWO

Tests Compared	M_1-M_2	P.E. M_1-M_2	Diff. / P.E. Diff.
Story Form – Timed Dictation	.20	.1967	1.01
Story Form – List Form	1.50	.2104	7.13
Story Form – Multiple-Choice	5.31	.3388	15.67
Story Form – Oral Form	2.66	.3792	7.01
Timed Dictation – List Form	1.70	.1918	8.86
Timed Dictation – Multiple-Choice	5.51	.3200	17.22
Timed Dictation – Oral Form	2.86	.2495	11.46
List Form – Multiple-Choice	3.81	.2828	13.47
List Form – Oral Form	1.16	.1862	6.23
Multiple-Choice – Oral Form	2.65	.3077	8.61

Whenever the difference between two means is equal to or greater than four times the probable error of the difference, this difference is considered to be statistically significant. In all except one instance, the differences

between the several means as given in the last column of Table II appear to be significant as the ratios exceed this standard of 4. In the one exception, story form—timed dictation, the difference between the two means is .20, which is only 1.01 times the probable error of the difference between the means.

The percent of the forty-three pupils spelling each word correctly, tabulated according to type of test, is given in Table III. The results obtained by Ashbaugh are given in this table under the column labeled *Iowa Standard*.

TABLE III

PERCENT OF PUPILS SPELLING CORRECTLY THE TWENTY WORDS

Word	Type of Test					Iowa Standard
	Story Form	Dictation	List Form	M.-Choice	Oral	
ninety	51%	35%	61%	71%	66%	54%
succeeded	78	68	89	96	87	54
similar	54	47	68	89	68	54
nickel	47	37	44	57	59	51
admission	42	39	50	52	59	50
carnival	37	47	44	64	47	50
appearance	16	19	16	16	16	51
excitement	32	30	42	54	44	50
planned	64	71	82	94	96	45
finally	59	64	57	85	66	44
occasionally	9	19	16	61	19	33
convenience	14	2	7	26	14	23
orchestra	23	23	35	71	47	55
exhibition	9	9	14	64	21	23
schedule	19	14	21	61	19	9
arriving	50	68	89	82	94	63
various	44	47	52	68	64	59
humor	59	59	66	78	73	78
Saturday	78	64	78	87	82	87
island	73	78	80	96	89	93

It will be noticed that in most instances there is considerable difference between the results on the various tests. Some words were found easier to spell on one type of test than on others. For example, the percent of pupils spelling the word "ninety" correctly was 51 percent on the story form, 35 percent on the timed dictation, 61 percent on the list form, 71 percent on the multiple-choice, and 66 percent on the oral. Ashbaugh, on the other hand, found that 54 percent of his subjects spelled this word correctly on list tests. In the spelling of the twenty words the timed dictation test had the lowest percentages in nine instances, the story form in six, and the list form in one. There were three cases in which the timed

dictation test and the story form tied for low percentage. In one instance, however, in the spelling of the word "appearance," the timed dictation test had the highest percentage, 19 percent as compared with 16 percent on the others.

As each of the forty-three pupils spelled twenty words, there were 860 words spelled. This number multiplied by the number of situations, which was five, gave 4,300 spellings. Of these, 2,084 were misspelled. The misspellings are classified in Table IV according to the frequency of misspelling and according to the tests on which the errors occurred.

TABLE IV

NUMBER OF TIMES THE WORDS WERE MISSPELLED ONE, TWO, THREE, FOUR, AND FIVE TIMES, CLASSIFIED ACCORDING TO TYPE OF TEST

Frequency of Misspelling	Number of Instances	Number of Misspellings Classified According to Type of Test					
		Story Form	Timed Dictation	List Form	Multiple-Choice	Oral Form	Total
1	102	34	33	6	17	12	102
2	74	49	49	17	13	20	148
3	82	70	75	59	16	26	246
4	157	151	154	156	39	128	628
5	192	192	192	192	192	192	960
Total	607	496	503	430	277	378	2084

Column one indicates the number of times the same word was misspelled by a pupil on the various tests. Thus 1 means that a word was misspelled but once on the five tests. As an illustration, pupil A spelled *humor* incorrectly only once in the five trials. In the entire group, as shown in column two, there were 102 cases in which a word was misspelled once in five times; 74 cases in which a word was misspelled two times in five trials; 82 cases in which a word was misspelled three times in five trials; 157 cases in which a word was misspelled four times in five trials; and 192 cases in which a word was misspelled in all trials. Columns three to seven in the same table indicate the number of misspellings classified according to type of test in which they were made. Thus 34 of the 102 cases in which the word was misspelled only once in the five trials occurred on the story form of test, 33 on the timed dictation, 17 on the multiple-choice, and 12 on the oral form. There were, however, only six instances in which the single misspelling in five trials was made on the list form. This is but half the number occurring in the next ranking test, the oral form. In like manner, the number of cases in which a word was misspelled twice on the five different tests occurred most often on the story form and

the timed dictation tests. That is, out of the 74 instances where a pupil misspelled the same word on two of the five tests, making a total of 148 misspellings, 49 of them occurred on the story form, 49 on the timed dictation, 17 on the list form, 13 on the multiple-choice, and 20 on the oral form of test. In the cases in which a word was misspelled three out of the five times by a pupil the errors occurred 70 times on the story form, 75 on the timed dictation, 59 on the list form, 16 on the multiple-choice, and 26 on the oral form. When mistakes were made on four of the five tests, they occurred 151 times on the story form, 154 on the timed dictation, 156 on the list form, 39 on the multiple-choice, and 128 on the oral form. There were 192 instances when a word was misspelled on all five tests. The total number of misspellings occurring on the various tests were: 496 on the story form, 503 on the timed dictation, 430 on the list form, 277 on the multiple-choice, and 378 on the oral form.

CONCLUSION

1. Considerable difference was observed between the results on the five tests. Some words were found easier to spell on one form of test than on others. In general, the timed dictation and story form of tests appear most difficult and the multiple-choice the easiest. This is in harmony with the results found in most studies of tests which show that recall tests are more difficult than recognition tests. When the validity of a diagnostic spelling test is determined by the difficulty of the test the first two tests mentioned above would, of course, be the most valid.

2. On the basis of the consistency of misspelling, the list form of test appears to be the best for diagnostic purposes. For if a pupil knows a word the chances are greater on this test than on the other tests that he will spell it correctly, and on the contrary if a pupil does not know the spelling of a word the chances are also greater on this form of test than on the others that he will misspell the word. It may be that these results were influenced by the fact that the pupils were more accustomed to the list form than to the others. Then, too, due to the construction of the test where all attention is concentrated on one word, the list form of test is less influenced by irrelevant factors than are the others.

3. It appears evident from the data that the different tests called for different abilities. Many of the pupils were able to recognize a word correctly although they could not spell it. Others, again, were able to write the word correctly but not able to spell it orally. The opposite was also true. Therefore, when determining whether a child knows the spelling of

a word or not, the situation in which he is to use the word is an important factor that must be taken into consideration.

4. These results should not be considered as complete or final. It may be that varying the procedure, that is, giving the tests in a different order, repeating the tests, including different forms or situations, will produce different results. These variations raise suggestive problems.

ABILITY OF HIGH SCHOOL PUPILS IN COMMON FRACTIONS

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THE studies of pupil difficulties in the fundamental operations in arithmetic made have up to this time largely been confined to the pupils of the elementary school. The studies have revealed that children have a wide variety of difficulties and that there are a variety of causes for these difficulties. On the basis of this knowledge attempts have been made to devise diagnostic tests which would make possible an analysis of the difficulties pupils experience in the fundamental operations involved in the various number processes.

Brueckner[1] has carried the detailed analysis of pupil difficulties into the field of common fractions. He devised tests in each of the four fundamental operations involved in common fractions with each test containing all types of examples peculiar to each operation. The tests consist of 40 types of examples in addition, 53 types in subtraction, 45 types in multiplication, and 40 types in division. Kelly[2] used the Brueckner tests in an attempt to determine the relative difficulty of each type of example in common fractions for children of the sixth grade.

Information is lacking, however, regarding the difficulties in fractions experienced by pupils of the level commonly referred to as the secondary school, including grades seven to twelve. No studies have been reported to determine the character of the growth curve of ability in the operations in fractions for the interval between the elementary school and adult life, namely, during the secondary school period.

The purpose of this report is:

1. To give information concerning the nature of the curve of growth in ability to work types of examples in common fractions for pupils in the grades from seven to twelve inclusive.

2. To determine to what extent the factor of mental capacity affects the curve of growth in ability of pupils of the secondary school to work types of examples in the operations of common fractions.

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[1] Brueckner, Leo J. *Diagnostic and Remedial Teaching in Arithmetic* (Chicago: John C. Winston Co., 1930), pp. 161-200.

[2] Kelly, Fred E. "The Relative Difficulty of Types of Examples in Common Fractions." Master's Thesis, Minneapolis, Minnesota, University of Minnesota, 1929, Unpublished.

METHOD

The Brueckner Diagnostic Tests in Fractions were given 623 Rochester, Minnesota, high school pupils distributed through the grades from seven to twelve as indicated by Table I.

All the pupils of grades seven, eight, nine, and ten were enrolled, respectively, in required courses of mathematics, arithmetic, algebra, and plane geometry. None of the eleventh grade were enrolled in a course of mathematics. Twenty-seven of the twelfth grade pupils were enrolled in a course of advanced algebra; only seven of these appear in the group who took the tests in fractions.

At the time the tests were given there were 268 pupils enrolled in the seventh grade; 245 in the eighth; 274 in the ninth; 228 in the tenth; 249 in the eleventh; 219 in the twelfth. The rate of elimination of pupils is very small in these schools.

TABLE I

NUMBER OF PUPILS TESTED IN EACH GRADE AND OPERATION

Operation	Grades						
	VII	VIII	IX	X	XI	XII	Total
Addition	105	105	102	99	107	105	623
Subtraction	103	104	102	100	106	104	619
Multiplication	103	103	102	100	106	103	617
Division	101	103	102	99	103	105	613

The tests were given in November. The tests in addition, subtraction, multiplication and division were given on consecutive days. Absence on the part of a few pupils on days during which the latter three operations were tested accounts for the smaller number of pupils tested in those operations. One hour was allowed for each test, but no student required more than forty-five minutes to complete a test. Rate of work is not considered in the findings of this investigation. All scores are based on the number of correct solutions on each test.

Six teachers including the writer administered the tests according to the directions in the manual accompanying the tests.[3] The papers were scored by the writer.

The reader is reminded at this point that this investigation deals with the abilities of pupils who have completed the study of fractions as pre-

[3] Brueckner, Leo J. Manual of Directions, Brueckner Tests in Fractions. Minneapolis, Minnesota: Educational Tests Bureau.

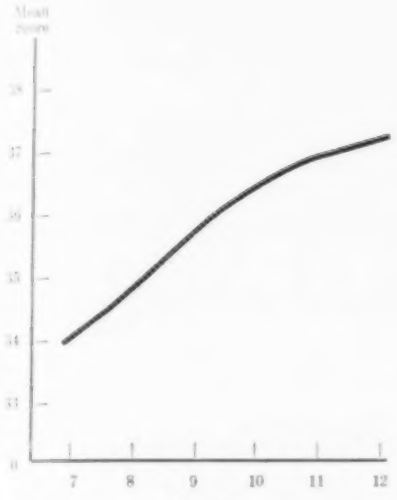

CHART I. SMOOTHED CURVE OF THE MEAN SCORES OF PUPILS OF GRADES SEVEN THROUGH TWELVE IN ADDITION OF FRACTIONS

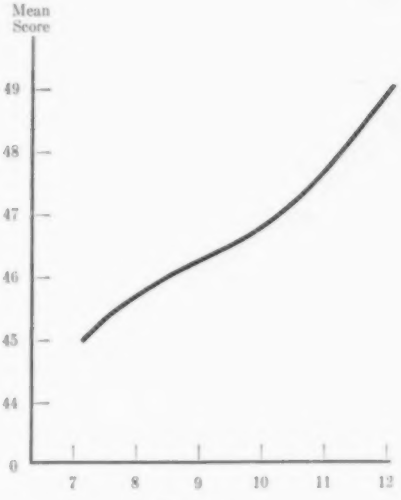

CHART II. SMOOTHED CURVE OF THE MEAN SCORES OF PUPILS OF GRADES SEVEN THROUGH TWELVE IN SUBTRACTION OF FRACTIONS

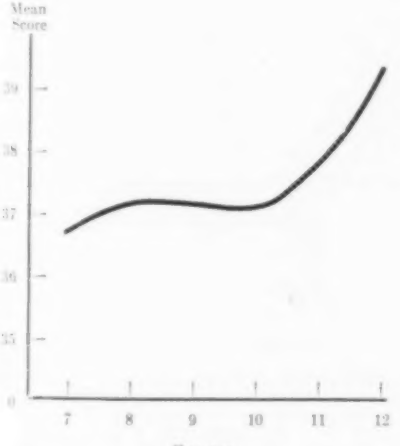

CHART III. SMOOTHED CURVE OF THE MEAN SCORES OF PUPILS OF GRADES SEVEN THROUGH TWELVE IN MULTIPLICATION OF FRACTIONS

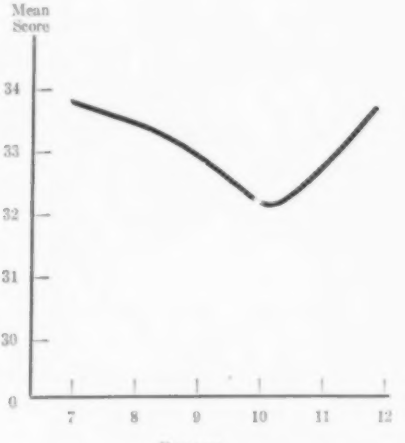

CHART IV. SMOOTHED CURVE OF THE MEAN SCORES OF PUPILS OF GRADES SEVEN THROUGH TWELVE IN DIVISION OF FRACTIONS

scribed in the curriculum provided by the State Department of Education.[4]

FINDINGS

Charts 1, 2, 3, and 4 give the growth curves in the four operations involved in fractions for pupils from the seventh through the twelfth grades. These are curves of the mean scores of each grade. Table II gives the mean scores in the operations of fractions of pupils in each grade.

TABLE II

THE MEAN SCORE IN EACH OPERATION FOR EACH GRADE

Operation	Grades					
	VII	VIII	IX	X	XI	XII
Addition	33.2	35.8	35.4	37.8	36.1	37.5
Subtraction	44.5	46.4	46.4	45.8	47.4	49.7
Multiplication	35.7	38.5	37.8	35.4	37.6	40.1
Division	33.6	34.3	32.6	32.9	30.6	35.0

In general it may be said that there appears to be a slight growth from grade VII to grade XII in ability in addition and subtraction of fractions as measured by these tests. It is clear that there is at least no retrogression in these abilities between grades VII and XII. With the exception of grade X there is a steady growth in ability in multiplication of fractions. In the division of fractions there appears to be a decrease in ability from grades VII to XI, but grade XII has a higher score than any of the other grades. The general conclusion may be drawn that ability to manipulate fractions at least does not decrease from grade to grade; in fact there is a definite tendency of growth of ability in all processes except division of fractions. As will be shown later, the differences from grade to grade are not to be explained by differences in the mental levels due to elimination of pupils in the higher grades. Increased maturity may be an explanation of the growth.

The mean score taken alone gives no evidence of comparative variability in performance of the individuals from grade to grade. For this reason the coefficients of variation within each grade are provided in Table III as a measure of the variations and differences in performance of pupils of the various grades.

To illustrate the significance of the differences in the coefficients of variation in Table III, we can compare the results for the 103 pupils of

[4] *Curriculum of the Elementary School* (State of Minnesota, Department of Education, June, 1928), pp. 71-100.

TABLE III

COEFFICIENTS OF VARIATION FOR ABILITIES IN FRACTIONS

Operation	Grades					
	VII	VIII	IX	X	XI	XII
Addition	18.9	11.2	18.7	10.4	14.9	9.1
Subtraction	19.6	17.5	16.8	17.2	17.1	10.9
Multiplication	15.6	10.1	15.3	24.4	22.2	11.8
Division	16.8	16.1	25.5	25.7	33.3	13.2

the seventh grade and the 106 pupils of the eleventh grade on the same test of multiplication in fractions. If we compare the mean performance of the two grades, 35.7 for the seventh, and 37.6 for the eleventh, it is clear that the score of the average eleventh grade pupil was 1.9 points higher than the score of the average seventh grade pupil. If taken alone, this result suggests a definite superiority in performance of the eleventh grade pupils; but to aid in the evaluation of this conclusion, a comparison of the variability of each grade should be made.

On the basis of standard deviations, the scores of the middle two-thirds of the seventh grade pupils ranged between 35.7 ± 5.6, i.e. between approximately 30 and 41, and the middle two-thirds of the eleventh grades ranged between 37.6 ± 8.38, i.e. between 29 and 45.

To compare the variability of pupils of the seventh grade with those of the eleventh grade, Pearson's method, $\text{C.V.} = \frac{\text{S.D.} \times 100}{\text{Mean}}$[5], can be used. The formula yields a coefficient of variation in multiplication of 15.6 for the seventh and 22.2 for the eleventh grade. Expressed as a ratio, the seventh grade pupils are $\frac{15.6}{22.2}$ or 70 percent as variable as those of the eleventh grade.

Further comparisons of the coefficients in Table III reveal that in addition the scores in the eighth grade are 59.9 as variable as the scores in the seventh grade; the ninth 98.5 percent as variable; the tenth 54.9 percent as variable; the eleventh 79.3 percent as variable; and the twelfth 48.3 percent as variable.

In subtraction the scores in the eighth grade are 89.2 percent as variable as the scores in the seventh grade; the ninth 85.7 percent; the tenth 87.7 percent; the eleventh 87.2 percent; and the twelfth 55.6 percent.

In multiplication the scores in the eighth grade are 64.7 percent as variable as the scores in the seventh grade; the ninth 98 percent; the tenth 156.4 percent; the eleventh 142.3 percent; the twelfth 75.6 percent.

[5] Garrett, Henry E. *Statistics in Psychology and Education* (New York: Longmans, Green and Company, 1930), p. 44.

In division the scores in the eighth grade are 95.8 percent as variable as the scores in the seventh grade; the ninth 151.7 percent; the tenth 153.9 percent; the eleventh 198.2 percent; and the twelfth 53 percent.

THE RELATION BETWEEN MENTAL CAPACITY AND ABILITY TO SOLVE TYPES OF EXAMPLES IN FRACTIONS

In an attempt to determine to what extent the factor of mental capacity affects the abilities of the high school pupils in their performance on the Brueckner Tests in Fractions, the students were grouped on the basis of intelligence quotients and the performance of pupils within the groups compared.

Table IV provides a summary of the distributions of the intelligence quotients of the pupils in each grade. The Terman Tests were used to determine the intelligence quotients. The measures of central tendency and variability indicate a uniformity in intelligence quotients throughout the grades.

TABLE IV

SUMMARY OF THE DISTRIBUTIONS OF THE INTELLIGENCE QUOTIENTS FOR PUPILS OF GRADES SEVEN THROUGH TWELVE

	Grades					
	VII	VIII	IX	X	XI	XII
Total	105	104	102	99	105	104
Mean	108.3	104.9	108.5	106.1	109.9	109.5
Median	107.9	105.8	108.0	106.4	110.3	108.9
S. D.	7.9	12.05	12.9	10.55	12.75	11.2
P. E.	5.32	8.12	8.7	7.1	8.55	7.55

The pupils of each grade were divided into three groups on the basis of their intelligence quotients. The ranges of I.Q's of the groups within each grade are as follows: Group I, 73-104.9; Group II, range of I.Q. 105-114.9; Group III, range of I.Q. 115-165. Table V provides the information regarding the total number in each group for each grade.

TABLE V

TOTAL NUMBER OF PUPILS FOR EACH GRADE IN GROUPS I, II, AND III

	Range of I. Q.	Grades					
		VII	VIII	IX	X	XI	XII
Group I	73–104.9	30	49	39	44	38	41
Group II	105–114.9	48	33	30	28	36	29
Group III	115–165	27	22	33	27	31	34

Tables VI, VII, VIII, and IX give means and coefficients of variation of the scores for each operation in fractions of the three groups in each grade.

TABLE VI
ADDITION

		Grades					
		VII	VIII	IX	X	XI	XII
Group I	Mean	33.7	34.1	34.9	35.4	34.7	37.5
	C. V.	16.8	16.3	16.0	14.7	22.6	9.4
Group II	Mean	33.2	36.6	34.1	38.1	36.9	37.5
	C. V.	21.5	8.3	28.3	4.8	10.6	4.9
Group III	Mean	33.6	37.7	37.2	38.4	37.8	38.7
	C. V.	16	5.6	7.4	6.1	8.2	11.9

TABLE VII
SUBTRACTION

		Grades					
		VII	VIII	IX	X	XI	XII
Group I	Mean	41.8	43.5	45.1	41.0	44.0	50.2
	C. V.	21.1	22.3	18.8	24.7	23.5	9.6
Group II	Mean	44.8	47.0	44.6	49.2	47.9	49.2
	C. V.	20.0	12.8	20.5	10.4	13.4	10.9
Group III	Mean	45.9	50.1	49.5	50.2	50.8	49.9
	C. V.	20.8	5.1	9.3	9.5	9.2	10.6

TABLE VIII
MULTIPLICATION

		Grades					
		VII	VIII	IX	X	XI	XII
Group I	Mean	36.12	37.2	36.7	33.5	34.9	39.0
	C. V.	17.3	12.2	18.1	36.6	28.5	12.9
Group II	Mean	35.84	39.18	37.0	36.9	39.0	39.7
	C. V.	14.4	7.3	15.5	23.4	14.2	10.1
Group III	Mean	35.16	40.5	39.9	37.6	40.1	42.3
	C. V.	17.0	8.2	9.8	22.9	16.0	6.2

TABLE IX
DIVISION

		Grades					
		VII	VIII	IX	X	XI	XII
Group I	Mean	33.1	33.6	29.9	30.6	30.7	33.8
	C. V.	17.4	16.0	34.1	35.0	32.5	16.0
Group II	Mean	33.4	34.2	32.2	35.5	31.9	35.6
	C. V.	18.9	19.6	25.6	14.9	31.4	9.3
Group III	Mean	34.1	35.6	36.1	34.6	33.3	35.9
	C. V.	13.2	7.8	7.9	20.9	27.6	10.3

The means in Tables VI, VII, VIII, and IX indicate that the growth curve of each group in each process is of roughly the same character as the curve of the entire group. However, the curves of the means are at

different levels for each group in each process. In general, the mean scores of those of greatest capacity appear at the highest level in all processes, and those of least capacity on the lowest level.

There is a great variation of scores within each group for each process. The coefficients of variation indicate that those of greatest capacity are less variable than those of least capacity, with but two exceptions, one in the twelfth grade in addition, the other in subtraction for the same grade. However, in both exceptions the differences in variation are slight. The greatest differences in variation appear between Group I and Group III in the eighth grade in subtraction with a coefficient of 22.3 for the former and 5.1 for the latter group. Expressed as a percent Group III is $\frac{5.1}{22.3}$, or 22 percent as variable as Group I.

SUMMARY

1. The curves of growth of the ability to solve examples in addition, subtraction, and multiplication of fractions indicate that in general the ability in these operations increases with maturity.

2. The ability in division of fractions in this group tended to decrease slightly through the grades of the secondary school until grade 12 was reached.

3. There is a great variation in the ability of individuals within each grade for each of the four operations in fractions. The amount of variation in addition and subtraction appears to be less, however, than in multiplication and division.

4. The amount of variation in ability in addition and subtraction of fractions is less for individuals in grades eight, nine, ten, eleven, and twelve as compared with those of the seventh. In multiplication and division individuals of the twelfth grade are less variable than those of the seventh, while those of the other grades are in general more variable.

5. The curves of growth in ability in the operations of fractions for the three levels of capacity are similar to the curve of the entire group. The curve for the group of greatest capacity is in general on the highest level of performance while that of the group of least capacity is in general on the lowest level.

6. There is a great variation in the ability in fractions between pupils within each group representing a different level of capacity. However, the ability of those in a group of greatest capacity is less variable than the ability of those in the group of least capacity.

ERRORS AND QUESTIONABLE HABITS OF WORK IN LONG DIVISION WITH A ONE-FIGURE DIVISOR

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In a previous study by the writer,[1] the relative merits of short and long division for a one-figure divisor were analyzed. The data from the former study showed that the long form of division is superior to the short form when the divisor is a one-figure number. Since the long form of division was recommended as the type to be taught, it seemed advisable to make a detailed study of the types of errors and questionable habits of work which pupils made when they divided in the long-form with a one-figure divisor. Hence, this study deals with the errors and questionable work habits made by students who took the test used in the former study already cited.

A critical analysis was made of errors from a total of 1211 test papers. These tests were given in each grade from the fifth to the fifteenth, inclusive. Grades XIII, XIV, and XV represent the grades for three years of normal school. There were approximately 100 cases for each of the eleven grades sampled.

In order to conserve space for publication, only the errors made by pupils from Grades V-VIII, inclusive, are reported in this study. It was assumed that the underlying causes of errors made by students above the eighth grade level contributed little to the phenomena which produce the errors because of the interval elapsing between the initial learning of the process and the time the test was taken. Hence, the data presented in the following pages are taken from a total of 453 test papers. The number of students in each grade is shown in Table I.

TABLE I

NUMBER OF STUDENTS TESTED IN EACH GRADE FOR GRADES V-VIII

Grade	Number of Cases
V	101
VI	104
VII	145
VIII	103
Total	453

[1] Grossnickle, Foster E. "An Experiment in Short and Long Division with a One-Figure Divisor," *Elementary School Journal* (March, April, 1934), pp. 496-506; 590-99.

Before a detailed analysis was made of each test paper, a tentative list of errors and faulty procedures was made from the studies reported by Buswell and John,[2] Brueckner,[3] Lazar,[4] and Burge.[5] As types of errors not listed in these studies were found, the check list used in this investigation was expanded. In the studies cited it was assumed that a pupil should divide by a one-figure divisor in the short-division form. Although the study by Burge dealt with multiplication, the technique used in that investigation was similar in some respects to that employed in this analysis.

The errors and questionable work habits were grouped under seven classifications. They were: (1) errors of combinations; (2) errors resulting from the use of remainders; (3) errors resulting from zero; (4) errors caused by faulty procedure; (5) errors resulting from lapses of attention; (6) errors resulting from bringing down; and (7) faulty or questionable habits of work. In some cases it was difficult to determine the correct classification of a type of error.

It would have been possible in certain cases to include a particular error or faulty procedure under two different classifications. The places in which this difficulty arose will be pointed out in the following discussion of the different types of errors. However, no type was catalogued more than once. For those cases in which it was possible to classify an error under two different groups, the writer's judgment was the sole criterion for determining the placement of the type of error. The number of such cases represents a very small percent of the total number of errors made on the test.

An error as used in this report is defined as any procedure which resulted in an incorrect quotient figure. If a student made eight errors in multiplication, in completing the thirty different examples on the test, eight separate errors were recorded under errors of combinations in multiplication. A questionable habit of work is defined as any device or crutch which was used by the student to secure the quotient. No incorrect quotient figures were attributed to the use of these devices. In each case,

[2] Buswell, Guy T., and John, Lenore. *Diagnostic Studies in Arithmetic*, Supplementary Educational Monographs, No. 30 (Chicago: University of Chicago Press, 1926), pp. 180-87.

[3] Brueckner, Leo J. *Diagnostic and Remedial Teaching in Arithmetic* (Philadelphia: John C. Winston Co., 1930), pp. 145-58.

[4] Lazar, May. *Diagnostic and Remedial Work in Arithmetic Fundamentals* (New York: Bureau of Reference, Research, and Statistics, Board of Education, 1928), pp. 55-60.

[5] Burge, Lofton V. "Types of Errors and Questionable Habits of Work in Multiplication," *Elementary School Journal*, XXXIII (November, 1932), pp. 185-94.

the use of different questionable work habits was counted once for each test paper. Thus, if a student checked each number brought down, that device was counted but once even though the student checked the numbers in each of the thirty examples on the test.

ERRORS OF COMBINATIONS

The greatest number of errors in each grade sampled was classified as an error of combination. An incorrect combination could occur in division, multiplication, or subtraction. The frequency of these errors is shown in Table II.

TABLE II

ERRORS OF COMBINATIONS IN GRADES V-VIII

Error	Grade V	VI	VII	VIII	Total for all Grades
1. Division	362	349	233	114	1058
2. Multiplication	194	196	193	92	675
3. Subtraction	86	106	97	45	334
Total	642	651	523	251	2067

Table II shows that the greatest and the least number of errors in combinations was found in division and subtraction, respectively. There were over three times as many errors in division combinations as in subtraction. For Grades III-VI, inclusive, Buswell and John[6] likewise found that the greatest number of errors was made in the division combinations, but they found more errors in subtraction than in multiplication. Most of the multiplication products which were incorrect constituted the product of some other multiplication fact. Norem and Knight[7] found that about 91 percent of multiplication errors were the correct response to some other combination. Furthermore, they found that about 67 percent of the errors were the correct answers to some other closely allied combinations. The percentage of similar errors was less in this study than that reported by the two authors just cited. This discrepancy in percentages may be due to the different conditions under which the errors were made. In the study by Norem and Knight, the pupil was dealing only with the multiplication

[6] *Op. cit.*, p. 139.

[7] Norem, Grant B., and Knight, F. B. "The Learning of the One Hundred Multiplication Combinations," *The Twenty-Ninth Yearbook of the National Society for the Study of Education* (Bloomington, Illinois: Public School Publishing Company, 1930), p. 568.

facts. In this study, the multiplication facts were integrated into a process which required estimation of quotient, subtraction, and other abilities needed for long division. The results obtained in this investigation are given in Table III.

TABLE III

MULTIPLICATION ERRORS WHICH WERE CORRECT PRODUCTS TO OTHER COMBINATIONS

Description of Error	Grade V	VI	VII	VIII	Total for All Grades
(a) Products	152	162	151	78	543
(b) Not products	42	34	42	14	132
(c) Incorrect product within one factor of true product	71	80	95	40	286
* Total Frequency	194	196	193	92	675

* (Sum of items *a* and *b*)

Table III shows that for all of the grades reported, 543 out of 675, or 80.5 percent of the multiplication errors were the correct products to other combinations. Likewise, 132 out of a possible 675, or 19.5 percent of the errors were not multiplication products. From the group of 543 errors that were the correct response to some other multiplication fact, 286 or 52.7 percent were within one factor of the correct product. An incorrect product is within one factor of the true product whenever the result is divisible by a number which is one more or one less than either factor of the correct combination. Thus, for the combination, $8 \times 6 = 48$, the products 54 and 42 are derived from the combinations 9×6 and 7×6, respectively. The first factor of these combinations is one more and one less, respectively, than 8 of the combination, 8×6. In a similar manner for the same combination fact, other products within one factor of the combination are 56 and 40. The latter two results are obtained from the combinations, 8×7 and 8×5, respectively. The factors, 7 and 5, are one more and one less, respectively, than the second factor of the combination, or 6. Thus, the four products 54, 42, 56, and 40 are all within one factor of either of the two factors of the combination, 8×6. Since fifty percent of the incorrect products were within one factor of the true result, it is apparent that a faulty response to a basic multiplication fact is closely related to the correct combination.

REMAINDER DIFFICULTIES

The number of errors resulting from the use of the remainder ranked next in frequency to errors of combinations. If an error occurred fewer than four times, an average of once for each grade reported, it was not

included in the summary table. The errors resulting from the use of the remainder are shown in Table IV.

TABLE IV

ERRORS OCCURRING IN USE OF REMAINDER FOR GRADES V-VIII

Error	Grade V	Grade VI	Grade VII	Grade VIII	Total for All Grades
(4) Used remainder within example greater than divisor	169	156	102	50	477
(5) Dropped final remainder when zero was final in quotient only	79	58	88	36	261
(6) Final remainder was two-or-more-figure number	54	68	32	11	165
(7) Used remainder as a new partial dividend	53	57	29	18	157
(8) Final remainder was one-figure number equal to or greater than divisor	32	35	28	7	102
(9) Final remainder correct in example but incorrect in quotient	5	17	10	6	38
(10) Final remainder reduced in fraction form and numerator of fraction written as remainder	0	8	12	10	30
(11) Last partial dividend written as a remainder	3	10	7	1	21
(12) Did not find final remainder	7	2	6	2	17
Total	402	411	314	141	1268

Table IV shows that the greatest number of errors from remainders was caused by leaving a remainder larger than the divisor. A resulting error from having a remainder greater than the divisor was Error 7. In the latter type, the remainder was used as a new partial dividend.

Error 5 could have been classified as a zero type. This error resulted from a zero type in which zero was final in the quotient only as will be discussed in more detail under zero difficulties. In the example of the type, $2\overline{)241}$, the pupil gave the correct quotient, 120, but the remainder of 1 was dropped. It was primarily in examples of the type illustrated in which the remainder was dropped. These data show that the zero difficulty caused the pupil to drop the remainder. For that reason this particular type could have been classified as a zero type as well as a remainder difficulty.

ZERO DIFFICULTIES

Zero was the cause of many different types of errors. Lazar[8] found that zero was the cause of many errors in long division. The examples on the test used in this study were so constructed that zero occurred in five different positions in dividend and quotient. Zero was found: (1) final in the quotient only; (2) final in dividend only; (3) final in both dividend and quotient; (4) not final in quotient only; (5) not final in div-

[8] *Op. cit.*, p. 58.

idend only. The types of errors which resulted from zero are shown in Table V. If a zero type of error did not occur at least an average of once per grade, that error was not reported in Table V.

TABLE V

ERRORS RESULTING FROM ZERO IN GRADES V-VIII

	Error	Grade V	VI	VII	VIII	Total for All Grades
(13)	Omitted final zero in quotient only	110	101	86	63	360
(14)	Zero final in quotient only, final dividend figure was written for quotient figure	24	19	26	21	90
(15)	Omitted final zero in both dividend and quotient	31	26	13	10	80
(16)	Omitted zero not final in quotient only	18	17	10	9	54
(17)	Extra zeros written in quotient because each remainder treated as a new partial dividend	25	0	0	0	25
(18)	After zero not final in quotient only, dividend disregarded and zero written in quotient	5	9	5	2	21
(19)	After zero not final in quotient only, dividend written as remainder	9	10	2	0	21
(20)	Omitted zero in the quotient when final in both dividend and quotient, but added zero as a remainder	5	3	6	3	17
(21)	Zero not final in quotient only, dividend figure written in quotient	2	2	5	4	13
(22)	Zero final in quotient only, extra zero annexed to dividend	0	0	6	6	12
(23)	Example completed only to zero, not final in quotient only	3	6	0	0	9
(24)	Remainder not carried to next dividend figure when zero was not final in quotient only	3	0	1	2	6
(25)	Zero written for remainder when zero was not final in quotient only	4	0	0	0	4
(26)	Last two quotient figures interchanged when zero was final in both dividend and quotient	3	1	0	0	4
(27)	Zero and next quotient figures interchanged when zero was not final in quotient only	0	0	4	0	4
	Total	242	194	164	120	720

Table V shows that the greatest number of zero errors occurred when zero was final in the quotient only as in the example $6\overline{)2761}$. This type of error occurred in each of the eleven grades sampled. The test contained three examples in which the zero was final in the quotient only, while most of the other zero types occurred only once. However, if the total number of errors caused by omission of final zero in quotient only were divided by three, then the number of errors of this type was more than twice as frequent as any other zero type.

Errors 5, 13, 14, and 22, a total of 723, were all caused by a faulty knowledge of zero which was final in the quotient only. The frequency of errors caused by this zero type was greater than for any other form of error except for errors of combinations in the division facts. Since so many errors were found in examples containing a final zero in the quo-

tient only, teachers should become conscious of the pupil difficulty which this zero type causes.

The description of most of the types of error in Table V is self-explanatory. A few cases, however, will be described in greater detail than given in the table. Error 19 was illustrated in the example $6\overline{)7838}$. The quotient was written as 13 + 38. (In the instruction sheet with the test, the remainder was to be written in the form indicated). When the quotient was written as 13 and no remainder, then Error 23 was exemplified. Error 20 was represented in the example $2\overline{)5900}$ when the pupil wrote the quotient as 295 + 0. When the quotient was given as 2905 for the same example, Error 26 was represented.

FAULTY PROCEDURES

In some cases it was difficult to determine if a type of error should be listed as a faulty procedure or as a lapse in attention. There could not possibly be a sharp dividing line which would enable one to make an objective classification for all particular types of errors or habits. According to the writer's judgment, the errors given in Table VI can best be listed as faulty procedures.

TABLE VI

ERRORS RESULTING FROM FAULTY PROCEDURES FOR GRADES V-VIII

Error	Grade				Total for all Grades
	V	VI	VII	VIII	
(28) Placed first quotient figure incorrectly	64	22	3	1	90
(29) Found only first and second quotient figures	90	0	0	0	90
(30) Began with a two-figure when a one-figure partial dividend was sufficient	36	22	22	6	86
(31) Used three-figure partial dividend but dropped hundred's figure	45	22	1	0	68
(32) Used only units' figure of two-figure partial dividend	23	30	0	0	53
(33) Duplicated divisor and made it a two-figure number	30	0	0	0	30
(34) Multiplied both dividend and divisor by 10 and then used a two-figure divisor	0	0	0	30	30
(35) Subtracted larger number from smaller (bottom up)	8	13	6	2	29
(36) Subtracted larger number from smaller (top down)	3	5	4	5	17
(37) Began with second instead of first dividend figure	0	6	3	0	9
(38) Began with two-figure partial dividend and wrote two quotient figures for the first estimation	5	1	0	0	6
Total	304	121	39	44	508

Table VI shows that the incorrect placement of the first quotient figure occurred most frequently in Grades V and VI. One of the chief reasons for writing the quotient above the dividend in long division is to facilitate the placement of the point in decimals. This necessarily demands that the

quotient must be placed properly with respect to the dividend figures. Since nearly all of the errors in placement were found in Grades V and VI, it is reasonable to assume that the correct placement of the first quotient figure was not sufficiently stressed when the pupils in those grades learned long-division.

In Error 29 the pupil found only the first and second quotient figures of each example. There were 30 examples on the test and there were 90 errors of this type. Hence, there were three pupils in the fifth grade who proceeded in this manner. A plausible explanation may be that the pupil was so familiar with a two-figure quotient in division in the long form with a two-figure divisor that he assumed that the quotient should always contain only two figures when the long form is used.

Using total frequency of occurrence for a type of error is not always a reliable measure of the importance to be attached to the error. Error 29 occurred as frequently as Error 28, but there were only three students who made the first error while there were many who made the second. It was the consistency of Error 29 which accounted for the large frequency. Hence, to have a perfectly valid measure of a type of error, both its frequency and its consistency need to be considered. In this study, only frequency is treated.

Errors 31 and 32 resulted from having a remainder greater than the divisor. In the illustration given, the remainder 3 is greater than the divisor. The pupil brought down the next figure and had a partial dividend of 37. At this point the tens' figure was dropped as far as usage in estimation was concerned and then the example was completed as shown. In the next estimation the hundreds' figure was dropped. If the remainder is greater than the divisor, the remainder must be treated as a new partial dividend or the pupil becomes hopelessly entangled in difficulties. In order to overcome difficulties as illustrated, the pupil should be taught to compare each remainder with the divisor.

```
  1350
2) 5700
   2
   37
    6
   310
    10
    0
```

In Error 35, the pupil subtracted a larger number from a smaller, as in the example 42-48. In this case the thought process was, "Eight from twelve are four." An error of this type may have been caused by a lapse of attention, hence, the 29 cases listed for this error could have been classified in Table VII. However, if a pupil subtracted downward as in Error 36, the error was distinctly a faulty procedure. For the same example, subtracting downward, the thought process was, "Two from eight are six."

LAPSES OF ATTENTION

Lapses in attention constituted the fifth classification of errors in long-division when the divisor was a one-figure number. In this type of error it was evident that the pupil knew the correct value or procedure but a lapse in attention caused him to write the incorrect number or to follow the wrong procedure.

TABLE VII

ERRORS RESULTING FROM LAPSES OF ATTENTION FOR GRADES V-VIII

Error	Grade V	Grade VI	Grade VII	Grade VIII	Total for all Grades
(39) Used correct multiplication product but wrote incorrect quotient figure	33	34	38	23	128
(40) Wrote extra quotient figure or figures	57	30	7	12	106
(41) Used product too small not detected in subtraction	20	30	26	12	88
(42) Wrote wrong factor of product for quotient figure	13	7	14	6	40
(43) Did not complete the example	13	9	10	7	39
(44) Forgot to multiply quotient figure by divisor	13	13	1	0	27
(45) Forgot had borrowed in subtraction	5	2	4	3	14
(46) Used last quotient figure for next divisor	1	2	7	4	14
(47) Misread own figures	2	4	3	1	10
(48) Forgot to write quotient figure although used correct product	8	0	2	0	10
Total	165	131	112	68	476

The most errors classified as lapses resulted when the pupil used the correct multiplication product but wrote the incorrect quotient figure. If the partial dividend were 51 and the divisor 6, the pupil used 48 as the product but he may have written 9 or some other incorrect number as a quotient figure. It is impossible to determine conclusively that the pupil wrote 9 for the quotient figure because of a temporary lapse in attention. An error of this type may have resulted from the pupil's faulty knowledge of the multiplication facts. However, evidence, presented in another study[9] shows that the error resulted from a lapse in attention.

Error 41 occurred in subtraction of a partial product from a partial dividend. If the partial dividend were 47 and the partial product 35, the pupil subtracted 5 from 7 and did not check on the figures in the tens' places. If the work is accurate when the divisor is a one-figure number, only the units' figures in the partial dividend and the partial product need to be subtracted. However, the pupil should be taught to check his work by subtracting the tens' figures of the partial dividend and product to see that the remainder for these figures is zero.

[9] Grossnickle, Foster E. "Reliability of Diagnosis of Certain Types of Errors in Long Division with a One-Figure Divisor," *Journal of Experimental Education*, IV (September, 1935), pp. 7-16.

When the wrong factor of a multiplication product is written for the quotient figure, as in Error 42, a faulty temporary association is formed. If the divisor were 6 and the partial dividend 31, the pupil may have written 6 for the quotient and 30 as a partial product. In this case the wrong factor of the product was written. Most of the errors of this type occurred in the first estimation of an example.

BRINGING DOWN

The test used as the basis of this study contained 30 examples. For 20 of these examples the quotient contained three figures each and for the remaining 10 examples, the quotient contained four figures each. The dividend for each example contained either four or five figures. Considering the size of the numbers encountered, the writer was surprised to find the relatively few errors which resulted from faulty procedures in bringing down. The resulting types of errors from bringing down are shown in Table VIII.

TABLE VIII

ERRORS RESULTING FROM BRINGING DOWN FOR GRADES V-VIII

Error	Grade V	Grade VI	Grade VII	Grade VIII	Total for all Grades
(49) Final dividend figure not brought down	78	29	27	5	139
(50) Same number brought down twice	13	23	2	7	45
(51) Figure in dividend other than final figure not brought down	19	19	4	2	44
(52) Figure not in dividend brought down	4	6	5	1	16
(53) Did not bring down dividend figure but wrote 9 for quotient figure	10	3	2	0	15
(54) Brought down two figures at once	7	2	2	0	11
(55) Figure in quotient brought down	0	3	3	3	9
(56) Did not bring down zero not final in dividend	2	1	3	1	7
(57) Brought down without subtracting for remainder	3	1	1	1	6
Total	136	87	49	20	292

```
  1999
2) 7814
   2
   58
   18
   40
   18
   22
   18
```

Table VIII shows that most errors classified under bringing down resulted from failure to bring down the final dividend figure. An error of this type may have been caused by a lapse of attention. Error 53 was the result of some other faulty procedure in the division operation within a given example. The pupil made an incorrect estimation in the first quotient figure in the example on the left. Then he brought down the next figure of the dividend. From that point the partial dividend was so large that he wrote 9 for a quotient figure for three consecutive estimations without bringing down a dividend figure.

QUESTIONABLE HABITS OF WORK

As previously stated, a questionable habit of work does not result in an incorrect answer to the example. The habit may result from not following the instructions called for on the test or from the use of a crutch or device. The first of these questionable habits of work is illustrated when the pupil wrote the remainder in the fraction form rather than as a remainder as directed in the instruction sheet. A crutch is illustrated by checking off each number as it is brought down. The different questionable habits of work and their frequencies are shown in Table IX.

TABLE IX

QUESTIONABLE HABITS OF WORK FOR GRADES V-VIII

Habit	Grade V	Grade VI	Grade VII	Grade VIII	Total for all Grades	Percent of Pupils
(1) Checked numbers brought down	16	23	31	26	96	21.2
(2) Final remainder not written in quotient	23	15	18	10	66	14.6
(3) Used visual aids in subtraction	10	17	7	4	38	8.4
(4) When remainder in subtraction was zero, zero written before next partial dividend	10	7	7	3	27	6.0
(5) Skipped an example on the test	12	2	6	5	25	5.5
(6) Changed to short form of division	4	6	9	4	23	5.1
(7) Checked off numbers when necessary to borrow in subtraction	5	6	5	1	17	3.7
(8) When no final remainder, zero written as remainder	9	6	0	0	15	3.3
(9) Used combination of short and long division	10	0	0	0	10	2.2
(10) Remainder written as a fraction	3	1	1	1	6	1.3
(11) When final remainder written as fraction, fraction not reduced in lowest terms	3	1	0	0	4	0.9
(12) Wrote zero before first quotient figure	1	2	0	1	4	0.9
(13) Quotient figure zero, multiplied divisor by quotient and then subtracted	0	3	1	0	4	0.9
Total	106	89	85	55	335	74.0

(a Frequency in Total Column is divided by 453, the number of different pupils used in Grades V–VIII)

Table IX shows that the most widely used questionable work habit consisted of checking each number in the dividend when the number was brought down to form a partial dividend. In Grade V, there was a distinct advantage which accrued from checking the figures brought down. For the papers which were checked in this trait in Grade V, the average number of errors classified under bringing down was 0.125; for those papers which were not checked in this trait, the average number of errors in this classification per test paper was 1.580. For the remaining grades, there was very little difference in the average number of errors classified as bringing down between those papers in which the figures brought down were and were not checked. The average number of bringing down errors for Grades VI-XV, inclusive, for the papers in which the figures brought down were and were not checked was 0.302 and 0.361, respectively. Since the distinct gain to be derived from the use of the crutch of checking the

figure brought down was pronounced in the first grade sampled in long-division in this study, this device may be an excellent procedure to be used in beginning of long-division.

Habit 3 was described as the use of visual aids in subtraction. In the illustration, when 1 was written before 2, Habit 3 was represented.

```
  4
9) 42
```

If the 4 of the dividend were crossed off and 3 written instead, Habit 7 was represented.

ANALYSIS OF TABLES OF ERRORS

A study of Tables II-VIII will show that the frequency of each type of error was not constant throughout all of the four grades reported. A summary table of the percentage of each of the six classifications of error for each grade is given in Table X.

TABLE X

PERCENT OF ERROR FOR EACH CLASSIFICATION FOR GRADES V-VIII

Classification of Error	Grade				Total for all Grades
	V	VI	VII	VIII	
Combinations	34.0	40.8	43.6	39.0	38.8
Remainders	21.2	25.8	26.2	21.9	23.8
Zeros	12.8	12.2	13.6	18.6	13.5
Faulty Procedures	16.1	7.6	3.2	6.8	9.5
Lapses of Attention	8.7	8.2	9.3	10.6	8.9
Bringing Down	7.2	5.4	4.1	3.1	5.5
Total Number	100.0	100.0	100.0	100.0	100.0

Table X shows the percentage of errors due to combinations was smallest in Grade V. On the whole, the higher the grade level of a pupil, the greater the percentage of errors which resulted from wrong combinations. This condition existed through all of the grades sampled from Grades V-XV. For Grade XV, errors of combinations constituted 65 percent of the total number of errors made. On the other hand, there was a tendency for the percentage of errors due to faulty procedures to decrease as the grade level increased. For Grade XV, only 2 percent of errors were classified as faulty procedures.

The type of error which remained somewhat constant throughout the grades sampled was due to the use of zero. Table X shows that for Grades V-VIII, the percentage of errors due to zero was 13.5; for Grades V-XV, the percentage of errors due to zero was 13.3. It is quite probable that the pupil never learned the correct procedure to follow when dealing with zeros at the time division was taught and throughout his grade progress he continued to practice the faulty use of zero that he first learned.

Tables II-IX, inclusive, (not including Table III) show that on the whole there was a diminution of the number of errors and habits as prog-

ress was made through the grades. These tables do not show the number of different errors or questionable habits per pupil in each grade. Table XI shows the frequency of the number of different errors or habits on each test paper for each grade.

TABLE XI

FREQUENCY OF DIFFERENT ERRORS AND HABITS ON EACH TEST PAPER FOR GRADES V-VIII

Number of Errors or Habits	Grade V	VI	VII	VIII	Total Number of Pupils
0	4	10	21	20	55
1	6	4	12	10	32
2	7	5	17	13	42
3	7	6	16	17	46
4	6	9	16	9	40
5	5	4	20	11	40
6	7	3	11	5	26
7	3	15	6	9	33
8	11	7	8	2	28
9	3	6	2	1	12
10	9	9	4	2	24
11	9	5	2	1	17
12	3	4	2	1	10
13	4	1	2	0	7
14	6	4	2	0	12
15	6	2	3	1	12
16	2	5	1	0	8
17	0	2	0	0	2
18	1	1	0	1	3
19	0	1	0	0	1
20	1	1	0	0	2
21	0	0	0	0	0
22	1	0	0	0	1
Total	101	104	145	103	453
Median	8.5	7.7	4.4	3.5	5.3

Table XI shows that the greatest number of different types of errors and questionable habits for each test paper was made in Grade V, the first grade sampled. On the other hand, the smallest number of different types of errors and habits was made in the most advanced grade tested. The median number of errors and habits for Grade XV was 1.9. On the whole, the number of different errors and questionable habits per person declined as the grade level increased. The greatest amount of reduction between any two successive grades occurred between Grades VI and VII. Grades V and VI each contained more than twice as many different types of errors and habits per pupil than for any of the eight grades above the level of the seventh. Buswell and John[10] found that the median number of errors per pupil in division for Grades V and VI were 7.1 and 7.0, respectively. These authors made their diagnosis from results obtained from tests which

[10] *Op. cit.*, p. 125.

contained divisors of both one-and-two-figure numbers. In this study only one-figure divisors were used.

SUMMARY

This investigation dealt with the types of errors and questionable habits of work which pupils in Grades V-XV, inclusive, made when they divided in the long form of division with a one-figure divisor. In order to save space in reporting the findings, the results were taken from pupils in Grades V-VIII, inclusive. There was a total of 57 different errors and 13 questionable habits of work which occurred at least an average of once per grade. These errors were classified under six different groups and a seventh group was made for questionable habits of work. According to frequency of errors, the classifications for errors and habits of work were: (1) errors of combinations; (2) errors resulting from the use of remainders; (3) errors resulting from the use of zero; (4) errors resulting from faulty procedures; (5) errors resulting from lapses of attention; (6) errors in bringing down; and (7) questionable habits of work. The frequency of occurrence of each error was found on each test paper, but each questionable habit of work was counted one per test paper regardless of how often the habit occurred on that paper.

Although there were 57 distinct different types of errors made by the students tested, many of these errors were very infrequent. Errors of combinations in division, multiplication, and subtraction, omission of final zero in quotient only, using a remainder greater than the divisor, and dropping the remainder when zero was final in the quotient only, constituted 59.4 percent of the total frequencies of errors noted in this study. Thus, if a teacher is able to give special consideration to the six types of errors enumerated, provision has been made for almost 60 percent of the total number of errors which will impede pupil progress in long division with a one-figure divisor.

As a general rule, the higher the grade level of a pupil, the number of different types of errors made was fewer. In the lower grade levels, faulty procedures were more frequent than in the higher grades.

The percentage of zero types of errors was somewhat constant throughout all grade levels. This constancy of error may have resulted from lack of knowledge concerning the procedure or treatment of zero types. The greatest number of zero-type-errors resulted in examples in which zero was final in the quotient only. The number of errors which resulted from zero final in quotient only ranked next in frequency to the number of errors resulting from combinations in division. The latter type was more frequent than any other.

STAFFS AND SALARIES IN CITY SCHOOL RESEARCH DIVISIONS

WILLIAM G. CARR
Director Research Division, National Education Association

THE seventh biennial survey of salaries paid city school employees conducted by the Research Division of the National Education Association has just been completed.[1] This year the number of cities reporting was 1,989. Nearly three-fifths of all cities in the country, and practically every one of the Nation's larger cities are included. The complete reports of the study cover all types of employees. This article deals especially with the salaries paid research workers. This includes employees reported as directors, assistant directors, supervisors, or assistant supervisors of research, tests and measurements.

Trends since 1930-31—It is well known that all school salaries have suffered reductions during the economic depression. Table I shows this trend in terms of the median salaries for directors and assistant directors of research in city school systems as revealed by the biennial surveys for the school years 1930-31, 1932-33, 1934-35.

In reviewing these figures it should be remembered that probably the lowest point reached by salaries is not shown. Nationwide estimates as compiled from state departments of education indicate that it was in 1933-34 that the average salary levels in the teaching profession reached their lowest point. Thus, for example, although research directors in the larger cities suffered an average reduction of 22.1 percent in salary between 1931 and 1935, it is likely that the average reduction between 1931 and 1934 was even greater.

These figures should also be considered in connection with suitable measures of the cost of living. Although no index numbers of the cost of living are perfectly adapted to the teaching group, the following trends are indicated by recent reports of the National Industrial Conference Board:

Date	Index of cost of living
July 1929	100.0
February 1930	98.5
February 1931	89.6
February 1932	80.1
February 1933	72.1
February 1934	78.3
February 1935	82.4

[1] The full reports of these surveys are available in various *Research Bulletins* and in the *Special Salary Tabulations.* Students of salary problems are invited to write the Research Division for further details.

TABLE I

SALARIES PAID DIRECTORS AND ASSISTANT DIRECTORS OF RESEARCH, TESTS AND MEASUREMENTS, 1930-31, 1932-33, 1934-35

Population groups	Median salary paid supervisors of research, tests and measurements					Median salary paid assistant supervisors of research, tests and measurements				
	1931	1933	1935	Percent decrease 1931–35	Percent decrease 1933–35	1931	1933	1935	Percent decrease 1931–35	Percent decrease 1933–35
1	2	3	4	5	6	7	8	9	10	11
I over 100,000	$3,967	$3,433	$3,090	22.1	10.0	$3,020	$2,900	$2,750	8.9	5.2
II 30,000 to 100,000	2,620	2,557	2,217	15.4	13.3	1,900	2,075	1,800	5.3	13.3
III 10,000 to 30,000	2,150	2,075	1,950	9.3	6.0	.....	.....	.....	....	....
IV 5,000 to 10,000	2,425	.....	2,250	7.2	....	.....	.....	.....	....	....

Salaries and city size.—Table I also brings out the usual tendency for salaries to increase with the size of the city. There is one exception to this general rule, namely, that the few cities below 10,000 in population which employ research directors pay salaries which are higher on the average than those paid by cities with populations between 10,000 and 30,000. The figures also indicate a definite tendency for the research workers in the larger cities where salaries are higher to receive the most severe proportionate salary reductions. Again, however, an exception must be noted in the case of the research workers in the cities of Group IV. However, no groups and very few individuals within the teaching profession have escaped salary reductions. There is already a slight tendency toward restoration. It remains to be seen, however, whether present trends toward economic recovery and higher living costs will be paralleled by salary increases or whether school employees will be left stranded at the low levels enforced by the depression.

Number of research workers.—The extent to which the depression has reduced the number of employees in city school research bureaus may be gaged by the figures from twelve of the larger cities (all over 500,000 in population) which reported the number of such employees in 1931, 1933 and 1935. These twelve cities together reported in 1931, 54 directors and assistant directors of research, tests and measurements. The comparable figure reported for 1933 was 49 and for the current school year 40. In other words, the number of research workers in these city school systems, has decreased by approximately 26 percent. It should be remembered, however, that the number of employees may not be used as a complete measure of the amount of research service rendered because the assignments of duties to the various types of positions vary from time to time even within the same city. When research workers are assigned heavy administrative and teaching responsibilities, as has tended to be the case during the last few years, the research service has actually been curtailed even though the number of employees holding the title research worker might remain unchanged.

EDITORIALS

SPECIFICS VS. GENERALITIES FOR FIELD WORKERS

THE need for research in this period of social and educational confusion is very great. Unless significant facts portraying accurately the general status of social, political, industrial, and educational conditions and pointing the most desirable directions for development are made available, the changes and innovations made are apt to be the outgrowth of personal whims, fancies, and prejudices. Therefore, it seems patent to suggest that directors of research and those who are especially qualified for engaging in such activities should exert utmost effort to stimulate the collection and interpretation of pertinent data. This stimulation should not be confined to lengthy expositions on the needs, virtues, and values of engaging in the activities of research, but should include many types of suggestions to facilitate participation in such work. One type of suggestion is a list of simple, clear-cut and well defined problems and a statement of the kinds of data needed to throw light on the solution of the problems. The definition and statement of the significant problem may well be the outgrowth of the specialist's analysis of the situation at hand. It is almost axiomatic that a clearly defined statement of a problem represents half of its solution.

It naturally follows that the specialist in educational research, if he will list only the most vital issues pertinent to the solution of a vexing problem, will stimulate wide and active participation in the intensive study of those issues. Such a list will be welcomed not only by those less informed in the techniques of research, but also by other specialists in research. One has merely to refer to the interest of the readers of the Journal in the list of proposed topics for master's theses and doctor's dissertations for each academic year as annually published in the January issue for evidence of the value of presentation of such lists as advocated. It is ventured that one of the distinct contributions made by Hubbard in his most valuable article, "Today's Youth Problems," in the January, 1936, issue of *The Journal of the National Education Association* is the list of timely, concrete and intriguing problems for investigation. It is predicted that, as the result of the publication of this list, agencies in many communities who would have remained inactive will be stimulated to undertake one or more of the investigations.

While the publication of lists of problems suitable for investigation will be helpful, the writer wishes to go even farther and to suggest the publication of suggested methods and techniques for collecting and interpreting the data needed in the solution of the listed problems. Hubbard, in the article mentioned, does not offer specific methods and techniques but he does indicate a list of well selected references which portray the methods and techniques employed by other investigators. References like these will be, no doubt, a great boon to those desiring to undertake some of the proposed investigations, but the inclusion of suggested inquiry forms, interview blanks, and of statements of the sources of available data and of the methods of treating them would have been even more helpful. Many schoolmen recognize the importance of studying the unemployed youth in their respective communities or of making a follow-up of the graduates and the non-graduates attending the junior and senior high schools in their communities, but they do not have a very clear conception of the methods and techniques which should be employed in such investigations. Mention of a few definite suggestions of procedure would be a great incentive for undertaking the investigations and would guarantee more adequate procedures.

Two objections may be urged against the practice of exhibiting a list of problems with definite suggestions for their solution. Some will protest on the grounds that sensing, analyzing and defining the problem constitutes one of the most vital parts of the training of the research workers; others, that the existence of ready-to-be-administered inquiry and interview forms or outlined techniques will encourage the mediocre graduate students in our institutions of higher learning and the relatively untrained research worker to stampede the field of educational research. In general, the writer recognizes the force of both of these suggestions. However, he contends that in the present emergency the primary objective with which the educational public should be concerned is not training in the development of instruments with which to do research or even in the training of the research worker, but in the collection of large masses of data, gathered in the most scientific ways possible, to aid in the solution of pressing educational problems.

If the worthy ends justify the means, and the writer believes they do, may the specialists in research use the columns of this and other appropriate journals for setting forth lists of clearly defined problems with positive suggestions of the techniques to be employed in their solution.

CLIFFORD WOODY

SCIENCE AND VALUES

This title taken by the retiring president of the American Association for the Advancement of Science, Edward L. Thorndike, for his address at the St. Louis meeting, is important for workers in all sciences.

The question raised is whether the methods of science, by which man determines what *is*, and predicts what will be under the same conditions, have validity in determining what values should be or must be accepted as the purposes or ends for human conduct.

Man has organized civilizing processes in himself and in his environment by his ability to look ahead; to make and use tools for particular constructions; to direct physical forces to his service; and to establish social order. Such things exist for a time but they do not repeat themselves necessarily or by predictable laws of natural mechanics. They are said to be artificial constructions. They have human values but are not brought into existence by the laws of physical nature and are realities to man only as they serve him, and are evidence of his abilities.

A similar situation appears with reference to the conduct of man, and this is the topic so ably presented by Doctor Thorndike from his wide study and detailed experience in the field of psychology as the basis of a matured judgment. His address at St. Louis should be made available for the use of publicists as well as of all thinkers in every field of human development. No report can, in justice to its importance, do more than to urge its careful study as printed in *Science* for January 3, 1936.

It is the purpose of the following discussion to present an application of the method of science to a pressing problem in education.

Accepting the predication that man, including the scientist, is, in all of his powers and purposes an integral part of nature, the question arises as to the classification of the activities of civilized man in his uses of life as an energy of nature. The biology of the organism of man, although he is classified as Homo sapiens—the wise family—is concerned mainly with the individual. The education of man, self-directed and ordered to secure a social and civic organization of personalities, predicates a distinct understanding and redirection of nature's energy other than that of biological metabolism.

The field for this study of human life is that of civilization as it unfolds through the education of man himself and through his uses of the forces of physical nature for the ends of social organization. In this field, education is one of the primary facts. As self education it is the thing which recurs in the life of personalities and of social organizations. It

recurs as the thing upon which depends continued success in the use of nature's socializing energy. The study of man cannot be separated from the energy for social organization characteristic of him as a personality and education names the fundamental activity of that energy. As John Dewey defines it, education "is a process of continuous reconstruction of experience, with the purpose of widening and deepening social content, while at the same time the individual gains control of the method involved." Educational research is directly concerned with the individual's control of the method of deepening the social content in this process.

The first work of educational research, as we know, has been concerned with determining a comparative rating of the intelligence abilities of different individuals and of the abilities at successive mental ages during the period of growth. It is on the basis of such mental development that a second and further research may help to determine the organization of instructional material required to secure education for social development. When we realize the conditions which need to be considered in this second field of research, we also realize that our present knowledge of the activities of intelligence, even for the younger ages, is inadequate. Apparently there is a difference in the quality of the action of mental ability as it deals with such different types of thinking as mathematics, history, science, and of language and the other arts of expression.

This situation means that intelligence ability is not sufficiently measured at either the early ages of school life or the ages approaching maturity, by what are now called tests of general intelligence. It is not enough to measure that part of the activities of intelligence which may be common to every such activity but not complete for any single type of that activity. For the purposes of education we need a measure of ability for each type of thinking required by the course of instruction. If this is the fact, then the first need for research is the development of several types of measures of intelligence ability which will in each case indicate native capacities in that type of subject matter at each mental age of pupils who are to study those subjects. By this adjustment of instruction to the various capacities for an understanding use in a natural way of elements of the needed social content, the school becomes that preparation for life which is very close to being the real life of social development. It is required, also, that types of subject matter be so organized and presented that the pupils can reconstruct the experiences in a way to deepen the social content of their own minds.

AN OBSERVER

G. A. B.

REVIEWS

Address all communications relative to book reviews to Editor Kai Jensen, University of Wisconsin, Madison, Wisconsin.

STUDEBAKER, JOHN W. *The American Way: Democracy at Work in the Des Moines Forums* (New York: McGraw-Hill Book Company, 1935), pp. XI + 206.

Here is the story of "democracy at work in the Des Moines Forums," by the man who was superintendent of schools of Des Moines when this experiment in adult education was begun, and who is now United States Commissioner of Education. It is an incisive criticism of the place of "education" in modern democracy; it is a plea for free discussion in order to "make democracy work"; it is a discussion of the response of "leaders" and fractions of the public to this sort of experiment; and it deals with the part that state and federal agencies should play in making education more effective. "After a year of public forums" the author argues that there is a fundamental conflict in American life—between "those who believe in capitalistic democracy, both in its essential philosophic and in its practical aspects," and "those confused and discouraged citizens who lack faith in a social system whose philosophy they have never clearly understood and whose extremely complicated practical operating mechanisms, now much out of gear, they have never glimpsed." He holds explicitly to the opinion that "the concept of capitalistic democracy" is the ultimate doctrine for America—"The American Way"; and he wants all who hold with him to join in providing for the doubtful and confused ones more of "those prolonged educational experiences which have brought faith in capitalism to those who now possess it." In other words, he identifies "education"—for America—with a thorough indoctrination in this faith in capitalistic democracy; and he feels sure that if this it not provided for all, we shall probably shortly end in some sort of social cataclysm.

Well, no; Mr. Studebaker's argument is not quite so clear cut as this last statement makes out. He would resent the suggestion that he is for indoctrination. He wants the "common people" to have a share in rebuilding "the scattered parts of the great machine." He wants conservatives to join "with their radical brethren in supporting a program of civic education," and he feels that in this way "the abuses of capitalism" will be cured, individualism will be re-created "within a new pale of social justice," and democracy will be salvaged "through truly fashioning it to the common good." None the less, when all this curing, re-creating, and salvaging has been accomplished, we shall still have "capitalistic democracy"—whatever that may mean. In short, we shall change, and still be the same.

All these things must be accomplished under the leadership of the "ingenious educators of the nation." That is, education belongs to the schools and school men. Now, as Mr. Studebaker says, it was the failure of our schools to develop free,

creative minds that makes necessary this resort to adult education and these "democratic forums." Is it not asking a good deal to expect these new instruments to produce a more desirable result, if they are to be dominated by the same old leaderships? Our American "faith in education" is sublime, but it should scarcely be bulky enough to blind us to the fallacy of this argument!

JOSEPH K. HART

TUGWELL, REXFORD G., AND KEYSERLING, LEON H. *Redirecting Education, Volume I, the United States* (New York: Columbia University Press, 1934), pp. IX + 273.

The book consists of five sections by as many authors: (1) The Social Objectives of Education (Tugwell); (2) Social Objectives in the American College (Keyserling); (3) Economics in the College (Blaisdell); (4) History in the College (Cole); and (5) Political Science in the College (McGoldrick). The first of these treats of education in general while the last four are directed toward a study of problems of college education.

There runs through the book the note that *laissez faire* as a social policy is dead and must be replaced by a planned management of society. A new social science —a "normative science"—which relates to the possibility of *control* must take the place of the one that merely *describes* social phenomena. The theme that education in general, and particularly education in the social sciences, must be practical and dynamic is a unifying thread in the five essays.

The 112 page opening essay by Tugwell is very brilliantly written and entirely sound in social and educational theory. With swift touches he paints the picture of the origin of certain of our American traditions and philosophies of life, particularly how our tradition of individualism grew out of the self-dependence and isolation of pioneer life favored by a similar heritage from England, and how the agrarian and small-town ways of our early history hung over into our vastly changed present. Against this brief and little-integrated, but vivid and true, historical picture as background he throws his evaluation of our present situation and his consideration of the type of education needed for the direction of our present and future social order. Instead of blind antagonism to change he calls for a type of social intelligence that will seek better social institutions through experiment—"with measures, even perhaps with control groups." "Society," he complains, "does not become a function of education because of education, no more than society, has aims; it is rather passive and fearful of offence" . . . "The real possibility that society may become a function of education seems to me implied in the idea of a managed society."

But, while Tugwell wants a type of education that will clarify concepts about the institutions of the present and will evaluate fearlessly all proposals for change and progress, he does not want a narrow indoctrination; he devotes a number of pages to criticising the element of indoctrination that he believes runs through the work of Professor Counts.

It is in this same strain that the other essays follow; all of them are well written and constructively suggestive.

This is one of a rather small group of outstandingly good recent books on social and educational reconstruction—in the same class with Rugg's *Great Technology*, Soule's *Coming American Revolution*, and Counts' *Social Foundations of Education*.

CHARLES C. PETERS
Pennsylvania State College

PORTEUS, STANLEY D. *The Maze Test and Mental Differences* (Vineland, New Jersey: Smith Printing and Publishing House, 1933), pp. IX + 219.

The Porteus Maze Test is one of the better-known tests used by clinical psychologists and mental testers. It has been in use now for about twenty years. It has been severely criticized by some and highly praised by others. It is still being used. In the book before us Porteus gives a valuable summary of this twenty-years' work and the net result seems highly favorable to the test in question.

The test is a highly adaptable test. It can be used in all sorts of situations and with all sorts of subjects. It has been given to many different racial groups. It seems suitable to primitive peoples such as Australian aborigines. It can be used with deaf children, with foreign-language-speaking children and with those who have speech difficulties.

The author began his work on this test because his experience with the feeble-minded led him to the conclusion that Binet type tests or verbal tests were not in themselves adequate for a diagnosis of feeblemindedness. The most noticeable trait of the mental defective is a lack of planning capacity, and it is planning capacity that Porteus believes the maze test primarily measures. The test correlates highly with social sufficiency and it is this ability, rather than pure intellectual capacity, that should determine the diagnosis of mental deficiency.

The book presents a valuable summary of the chief work done with the Porteus Maze Test. It also contains the author's theories as to general intelligence and mental deficiency. In addition it gives directions for giving and scoring the tests and the most up-to-date norms. One may not agree with everything that the author claims for his test, but evidence in abundance is presented to show that the Porteus Maze Test is and, probably will remain, a useful test in the psychologist's cabinet of tests.

R. PINTNER
Columbia University

RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to A. S. Barr, University of Wisconsin, Madison, Wisconsin.

BULLETINS

BELL, HUGH M. *The Theory and Practice of Student Counseling* (Palo Alto, California: Stanford University Press, 1935), 137 pp.

This bulletin contains a discussion of needs for standardized measures in counseling, development of adjustment questionnaires, the construction and use of the adjustment inventory, the validation of the adjustment inventory, summary and discussion.

BOWEN, HOWARD L. *The History of Secondary Education in Somerset County in Maine*. The Maine Bulletin, No. 35 (Orono, Maine: The University Press, 1935), 81 pp.

The author discusses the social, political, and economic background of Somerset County, secondary education before 1820, the Academy, later development of the Academy, (1820-1873), origin and growth of the Public High School (1820-1873), the growth of the Academy during the period of the Free High School (1873-1894), and the Free High School under State Aid, (1873-1933). Bibliography.

CASANOVA, TÉOBALDO. *Educational Psychology and Some Aspects of Education in Latin America* (San Juan, Puerto Rico: University of Puerto Rico, 1934), 170 pp.

The author discusses elementary education, secondary education, recent trends in education, the training of teachers, research in education, experimental investigation, testing, etc. Bibliography.

DANTON, J. PERIAM. "The Selection of Books for College Libraries: An Examination of Certain Factors which affect Excellence of Selection," *Library Quarterly* (October, 1935), pp. 419-456.

The main findings divide themselves into two parts, the first concerned with book selections as related to the librarians, and the second, with book selections as related to faculty members.

EWAN, S. N., JR. *The Relation of Class Size and Selected Teaching Methods to Pupil Achievement*, A Thesis in Education (Philadelphia: University of Pennslyvania, 1934), 109 pp.

After stating the problem and the procedure employed in the investigation, the author gives the results in Ninth Year General Science, in Tenth Year Latin II, in Eleventh Year French II and in Twelfth Year Modern Problems. Bibliography.

HELLER, J., AND OTHERS. *Le Self-Government A L'Ecole*, Publication of the Bureau of International Education (Geneva, Switzerland: 44, Rue des Maraichers, Geneva, 1934), 168 pp.

This publication is the result of an inquiry initiated by the International Bu-

reau of Education in 1930. The report is based upon data secured from England, Austria, Belgium, Brazil, Porto Rico, Spain, the United States, Hungary, Luxembourg, India and many other countries.

HEVNER, KATE. *Visual Outline of Psychology*, Students Outline Series (New York: Longmans, Green and Company, 1935), 94 pp.

The purpose of this outline is to supply the students with an accurate, and comprehensive survey of the fundamentals of psychology.

HOLY, T. C., AND OTHERS. "The School Plant," *Review of Educational Research* (Washington: National Education Association, 1935), pp. 337-439.

This report contains the summaries of research relating to technics for determining housing requirements in elementary, junior, and senior high schools, heating, ventilation and sanitation in school buildings; equipment, apparatus, and supplies; school playgrounds; public school plant insurance; operation and care of the school plant; types of construction and materials as related to the original cost, maintenance, and the operation of school buildings; plant development for higher education; recent trends in school-plant planning; and needed research in the field of school buildings and equipment. Bibliography.

JAKIEL, ALBIN. *La Formation Professionnelle du Personnel Enseignant Primaire*, Publication of the Bureau of International Education (Geneva, Switzerland: 44, Rue des Maraichers, Geneva, 1935), 402 pp.

The author presents a detailed report of the professional education of teachers in a number of countries the world over: Albania, Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Canada, Chili, and many others.

MEYER, ADOLPH E. *Visual Outline of History of Education*, Students Outline Series (New York: Longmans, Green and Company, 1935), 91 pp.

The purpose of this monograph is to supply the student of education with an accurate and comprehensive survey of the fundamentals of the History of Education.

SCHNEIDLER, G. G., AND OTHERS. *Student Personnel Procedures and Techniques Used by Faculty Counselors at the University of Minnesota* (Minneapolis, Minnesota: 1935), 105 pp.

The author discusses the techniques of individual diagnoses, suggests treatment for various types of problems, and offers descriptive tests available for us in the several subject matter fields.

SEIPT, IRENE S. *Toward the Development of Emotional Stability*, Child Research Clinic Series (Langhorne, Pennsylvania: Child Research Clinic, The Woods Schools, 1935), 13 pp.

This is the third case study published by the Child Research Clinic of The Woods Schools, Langhorne, Pennsylvania.

THORPE, CLARENCE D., AND OTHERS. *Preparation for College English:* An Interpretation of College Entrance Requirements in English, University of Michigan Official Publication (Ann Arbor, Michigan: University of Michigan, July, 1935), 52 pp.

This bulletin summarizes what is expected in English of entering freshmen at the University of Michigan: The North Central Association report, analysis of the

North Central Association statement, freshman themes rated and analyzed, explanation of symbols used in the correction of themes, reading and literature, and reading list.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

ENGLE, T. L. "Achievement of Pupils Who Have Had Double Promotions in Elementary Schools," *The Elementary School Journal*, XXXVI (November, 1935), pp. 185-189.

From an analysis of 75 replies to a questionnaire in pupil achievement and acceleration the author concludes that some acceleration in the elementary school does not handicap a person educationally, vocationally, or socially.

HECK, ARCH O. "Recent Changes in Public-School Personnel Service," *Educational Research Bulletin*, XIV, October, 1935.

The author presents data assembled from the reports of 92 cities for each of four years: 1930, 1932, 1933, and 1934, relating changes in personnel services.

HECK, ARCH O. "Pupil-Personnel Staffs in 1934," *Educational Research Bulletin*, XIV (November, 1935), pp. 182-191.

This article reports data on the pupil-personnel staffs of public school systems: attendance officers, visiting teachers, children's clinic and census.

LEAVIT, F. M., AND OTHERS. "Pupil Subject Failure Study," *Pittsburgh Schools*, X (September-October, 1935), pp. 2-12.

The report offers data on the percentage of drop-outs, causes of failures with recommendations.

SHANNON, J. R. "What Laymen Know About School Administration," *The Teachers College Journal*, VII (November, 1935), pp. 11-18.

The author presents data of the knowledge of school administration by three groups: classroom teachers, students, and laymen.

CURRICULUM

ALYSTETTER, MABEL F. "The Reading Interests and Experiences of 214 Teachers," *Peabody Journal of Education*, XIII (September, 1935), pp. 80-84.

The author reports the results of a questionnaire study of the reading interests of 214 teachers of English.

CORBY, F. BYRON B. "High School Graduates Appraise Extra-Curricular Activities," *The School Review*, XLIII (November, 1935), pp. 672-682.

The author reports the results of a questionnaire study of the high school graduate's evaluation of extra-curricular activities. The author calls attention to the fact that the value of the activity to the pupil is not always considered.

JACKSON, NELSON A. "Vocabulary in Beginning Algebra," *School Science and Mathematics*, XXXV (October, 1935), pp. 690-694.

The author gives data on the pupils knowledge of the vocabulary of beginning algebra and raises the question of emphasis in this direction.

MELBO, IRVING R., AND WATERMAN, IRVAN R. "Evaluation of Textbook Materials in Handwriting," *The Elementary School Journal*, XXXVI (November, 1935), pp. 204-210.

The authors present data relative to a

suggested plan for evaluating textbook materials in handwriting.

METHODS OF TEACHING AND LEARNING

PYLE, W. H. "An Experimental Study of the Development of Certain Aspects of Reasoning," *Journal of Educational Psychology*, XXVI (October, 1935), pp. 539-546.

The author reports the results of an experimental study of the grades placement of materials in reading and arithmetic. Among other things the author concludes that the vocabulary of a selection has little to do with its proper grade-location.

STEWART, A. W. "Measuring Ability To Apply Principles," *School Science and Mathematics*, XXXV (October, 1935), pp. 695-699.

The author suggests certain adaptations of true-false and multiple choice types of tests for the measurements of the ability to apply principles.

WOODRING, MAXIE NAVE, AND FLEMMING, CECILE WHITE. "Recent Trends in Study," *Teachers College Record*, XXXVII (October, 1935), pp. 27-49.

The authors discuss recent trends with reference to the assignment, laboratory procedure, the library, home study, the study hall, reading, general study procedures and techniques in specific fields.

CHILD DEVELOPMENT

FLEMMING, E. D. "A Factor Analysis of the Personality of High School Leaders," *The Journal of Applied Psychology* (October, 1935), pp. 596-606.

The author finds four types of leadership ability: the entertaining, the brilliant, the culture-talented, and the just.

RECKLESS, WALTER C., AND OTHERS. "Child Development and Sociological Research," *The Journal of Educational Sociology* (October, 1935), pp. 65-128.

This issue of the *Journal of Educational Sociology* contains a number of papers relating to sociological research in the field of child development; the society for research in child development, the evaluation of the subjective methods of sociological research, objective methods of sociological research, a method for the sociological study of infancy and preschool childhood, a few critical points in applying objective sociological methods to the study of child development, research projects and methods, etc.

MEASUREMENTS, STATISTICS, AND SCIENTIFIC TECHNIQUES

MCCONN, MAX, AND OTHERS. "The 1935 College Sophomore Testing Program," *The Educational Record*, XVI (October, 1935), pp. 444-481.

The authors present the results of the 1935 College Testing Program listing the colleges that took part and the results.

MCCONN, MAX. "Examinations Old and New: Their Use and Abuses," *The Educational Record*, XVI (October, 1935), pp. 375-410.

The author discusses the uses and misuses of tests in relation to the several claims made for them.

SMITH, FRANCIS F. "Objectivity as a Criterion for Estimating the Validity of Questionnaire Data," *Journal of Educational Psychology*, XXVI (October, 1935), pp. 481-496.

The author presents data showing the extent of agreement among individual

respondents and the results for group ratings. Group ratings are found to be much more stable than individual ratings.

WRIGHTSTONE, J. WAYNE. "Constructing an Observational Technique," *Teachers College Record*, XXXVII (October, 1935), pp. 1-9.

The author reports upon certain recently developed techniques for the measurement of social behavior.

MISCELLANEOUS

"Abstracts of Unpublished Master's Theses—Indiana State Teachers College, 1934-1935," *The Teachers College Journal*, VI (July, 1935), pp. 181-196.

A statement of the problem, method, and results for a number of unpublished theses of Indiana State Teachers College, 1934-1935.

PARSONS, RHEY BOYD. "Teacher Education in Tennessee," *The School Review*, XLIII (November, 1935), pp. 690-699.

The author presents an analysis of the offerings in Education in Tennessee College.

PRALL, CHARLES E. "Application of Research Results," *The Journal of Higher Education*, VI (November, 1935), pp. 425-434.

The author reports upon three major types of researches: (1) those concerning teaching-learning procedures; (2) those devoted to single-variable studies; (3) studies of the administration of student personnel.

RESEARCH NEWS and COMMUNICATIONS

Address all research news and communications to Carter V. Good, Teachers College, University of Cincinnati, Cincinnati, Ohio.

DOCTORS' THESES UNDER WAY IN EDUCATION, 1935-1936

CARTER V. GOOD
University of Cincinnati

This is the sixth annual list of Doctors' theses under way in education to be published in the January number of the *Journal of Educational Research*. As in the past, limitations of space make it possible to list only new titles not previously reported in these columns. In a few instances the new problem is a delimitation or revision of a title previously reported.

A year ago comment was made on the manner in which rather broad fields of investigation are delimited by Doctors' candidates with the passage of time, and as the result of realization of the complexity of the large original topic selected. A few additional examples of this type of delimitation may be of interest. The present title will be given first, followed by the original topic in parentheses: "The Scholastic Achievement of Sixth Grade Children in Relation to Behavior Problems" (Achievement of Elementary-School Children in Relation to Behavior Problems), "A Decade of Controversy in American Institutions of Higher Learning" (A Decade of Controversy), "The Functions of Prairie View State College in the Development of Public Education for Negroes in Texas" (A Study of Negro Land-Grant Colleges), "An Experimental Investigation to Determine Whether Homogeneous Grouping or Heterogeneous Grouping Insures Greater Growth in Academic Achievement" (A Study of the Relative Effectiveness of a Specified Plan of Homogeneous Grouping Compared with Heterogeneous Grouping), "The Effect of Marginal Headings on Comprehension" (The Effect of Captions, Marginal Headings, Etc., on Comprehension in Reading), "The Measurement of Achievement in Music Education in Grades 4 to 6 and 7 to 9 Inclusive" (Diagnostic Tests in the Field of Music Based upon an Analysis of the Content of the Subject), "School Adjustment as Revealed by Teachers' Marks and Objective Tests" (Factors Other Than Intelligence Which Influence School Achievement), and "An Evaluation of the New York City Junior High School Physical Fitness Tests" (Physical Accomplishment of Negro Junior High School Boys in Harlem).

In a smaller number of instances a rather narrow or localized problem has been broadened. Examples, with the present title named first, are: "Colonial Schoolmasters, 1635-1775" (The Colonial Schoolmasters of Maryland, Virginia, and North Carolina) and "Standards Reflected in Fifty Sets of Primary Readers Published in the United States Since 1850" (Content and Methods in Primary Readers Used in Texas Since the Civil War).

In all cases the name of the student, the thesis title, and graduate institution are given, and in most instances the major

adviser is listed. No attempt is made in this compilation to differentiate between Ph.D. and Ed.D. problems.

The institutions which sent titles for inclusion in the 1935-36 list are: American University, Boston University, Catholic University, Colorado State College of Education, Columbia, Cornell, Duke, Fordham, George Peabody, George Washington, Harvard, Indiana, Johns Hopkins, New York, Northwestern, Ohio State, Pennsylvania State, Rutgers, St. Louis, Stanford, State College of Washington, Syracuse, Temple, Washington University (St. Louis), Western Reserve, Yale; and the Universities of Buffalo, California, Chicago, Cincinnati, Colorado, Illinois, Iowa, Kentucky, Michigan, Missouri, Nebraska, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Pittsburgh, Southern California, Texas, Virginia, Washington, and Wisconsin.

Readers who wish to know the titles of theses reported as under way in the years 1930-35 will find it necessary to examine the appropriate January number of this *Journal*. The completed dissertations are listed annually in the bibliography of research in education, published by the United States Office of Education.

NEW 1935-1936 LIST

1. Adams, Evelyn C. "Indian Wards and Federal Education: An Historical Study." Columbia. Bryson.
2. Adams, Henry L. "An Historical Study of the Development of Teacher Training in Connecticut." Yale. Brubacher.
3. Adams, Robert. "Teaching and Measuring Appreciation in English Literature." Temple. Owen.
4. Alderman, Everett. "Reading in the Social Studies." Pittsburgh. Yoakam.
5. Allen, Howard. "The Problem of the Central Rural School, with Special Reference to Transportation." Syracuse.
6. Allen, John S. "Criteria for Establishing Public Junior Colleges." New York.
7. Aiter, D. E. "Organization, Support, and Administration of Mission Schools in India." California. Hart.
8. Altmann, George. "The Development of Professional Preparation in Physical and Health Education in the United States." Western Reserve.
9. Anders, J. M. "The Development of the Social Science Curriculum." Peabody.
10. Anderson, H. S. "Non-Academic Factors in the Lives of High School Students." Colorado State College of Education. Rugg.
11. Andreen, Earl P. "A Study of Arithmetic Workbooks." Yale. Gambrill.
12. Andrews, Bonnie. "Legislation as a Determining Factor in High School Curriculum Making." California. Williams.
13. Andrews, Leonard O. "The Contribution of Pupil Expression of Their Own Needs to a Social Studies Curriculum." Michigan. Trow.
14. Armstrong, B. K. "Factors Which Should be Taken Into the Consideration of a Curriculum for Negro Colleges." Michigan. Woody.
15. Armstrong, Watson. "A Procedure for Setting Up a Program of Instruction for Out-of-School Farm Boys." Kentucky.
16. Armstrong, W. E. "An Analytical Study of the Characteristics of the Best and Poorest Teachers of Cer-

tain Subjects in Secondary Education." Stanford. Kefauver.

17. Arsenian, Sette M. "Bilingualism: Its Relation to Mental Development." Columbia. Pintner.
18. Ashby, Lyle W. "The Relation of the Efforts of the States to Provide Financial Support for Public Education to the Adequacy of the Support Provided." Columbia. Norton.
19. Ashton, Philip. "Teaching College Freshmen to Read and Study." Washington.
20. Axelrod, Hyman C. "Bilingualism and Its Relation to Personality." Columbia. Pintner.
21. Aydelotte, C. R. "The Educational Status of the Boys in Missouri CCC Camps." Missouri. Carpenter.
22. Ayre, H. G. "A Study of Individual Differences in Plane Geometry." Peabody.
23. Aznakian, Y. Charles. "The Economic Aspects of the Relation of Church and State in Education in New York." Columbia. Elliot.
24. Baldwin, Edward. "An Analysis of the Literature on the Teaching of History." Peabody.
25. Baker, Alice M. "The Scholastic Achievements of Sixth Grade Children in Relation to Behavior Problems." Columbia. Symonds.
26. Baker, Paul. "Provisions for Individual Differences in Social Science Teaching." Washington.
27. Baker, William E. "The Parent-Teacher Movement." George Washington. Whitelaw.
28. Bardwell, Richard. "An Inquiry into the Nature and Sources of Lay Opinion towards Public Schools." Wisconsin. Fowlkes.
29. Batchelor, W. C. "Changing Conceptions of Leisure and Leisure Education." Pittsburgh. Harris.
30. Baugher, Charles A. "A Determination of Trends in Organization, Finance, and Enrollment in Higher Education in Arts Colleges since 1900." New York.
31. Beck, Walter H. "Lutheran Elementary Schools in the United States." Temple. Kuehner.
32. Beede, Margaret. "Shelly as a Literary Critic." North Dakota.
33. Bell, Juliet. "Children's Behavior Reactions to Dental Treatment." Columbia. Meek.
34. Berger, Arthur. "A Study of the Drawings of Maladjusted Children." Fordham. Rock.
35. Bergstresser, John. "The Prediction of Academic Success in College with Particular Reference to the University of Wisconsin." Wisconsin. Fowlkes.
36. Berhardt, Morris. "Indebtedness, Bonded and Other, of Pennsylvania School Districts Compared with That of Civil Divisions." Temple. Owen.
37. Beu, Frank A. "The Legal Basis for the Organization and Administration of the Normal Schools and Teachers Colleges in the Territory of the North Central Association." Chicago.
38. Beyers, Otto J. "The Opinion Correlates of Deceit: An Experimental Inquiry into the Feasibility of Quantifying and Qualifying Deceit by Opinions." Washington University (St. Louis).
39. Bingham, Marjorie L. H. "An Analysis of Teaching Physical Education in the Activity School." Columbia. Williams.
40. Bird, Charles A. "The Non-instructional School Activities of Elemen-

tary School Teachers.'' Fordham. Cronin.

41. Black, E. H. ''The Place and Function of Subject Matter in the Public School Curriculum.'' Colorado State College of Education. Frasier.

42. Black, W. G. ''Trends of Development in Teacher Training in British Columbia.'' Chicago.

43. Blair, R. V. ''Phases of the Modern Theory of Conics and Their Professional Treatment.'' Peabody.

44. Bliss, Ruby. ''Major Aims in the Development of Functional Citizenship with Special Reference to an Understanding of and Participation in Society.'' Nebraska.

45. Block, Virginia L. ''Relationship of Certain Indices of Student Adjustment.'' Stanford. Kefauver.

46. Bolmeier, E. C. ''Legal Basis of School and City Relations.'' Chicago.

47. Borgeson, Gertrude. ''A Study of the Nursery School Lunch Period with Special Reference to Teacher-Child Inter-behavior.'' Columbia. Jersild.

48. Borass, Harold. ''An Experimental Study of the Relative Merits of Certain Written Letter Forms with Respect to Legibility, with Speed and Stability as Related Factors.'' Cornell. Kruse.

49. Bowdern, Thomas S. ''A Contemporary Factual Study of Vocations to the Priesthood and the Religious Life in the United States.'' St. Louis University. McGucken.

50. Bowman, Raymond P. G. ''Secondary Education in Virginia 1870-1906.'' Virginia.

51. Breidenstine, Aaron G. ''A Comparison of the Achievement of Pupils in Homogeneous Groups and Non-homogeneous Groups.'' Temple. Owen.

52. Brooks, Harold B. ''An Analysis of Educational Methods and Programs for Gifted Pupils in Junior High Schools.'' Southern California. Raubenheimer.

53. Brooks, W. G. ''The Relation between Quantity and Quality of Learning and Quantity and Quality of Stimulation in Addition of Fractions.'' Iowa. Knight.

54. Browman, David E. ''An Experimental Study of the Relative Merits of the Lecture Method of Teaching the Geometrical Elements to Pupils in an Industrial High School.'' New York.

55. Brown, Hubert E. ''Safety in New York City Elementary and Junior High Schools.'' New York.

56. Bucher, Henry G. ''A Program of Vocational Agriculture in the Secondary Schools of Pennsylvania.'' Temple. Owen.

57. Bucher, Jonas. ''Social and Economic Status of Students Taking Teacher Training Courses in Pennsylvania Colleges.'' Pennsylvania. King.

58. Buckley, Harold. ''An Experiment in the Teaching of Junior Business Training in the Philadelphia Junior High Schools.'' Temple. Owen.

59. Burton, A. R. ''The Development of a New Method of Teaching Accounting and the Relative Efficiency for Learning of This and Other Methods.'' Nebraska.

60. Burtt, Jerome. ''Meeting the Objectives of Secondary Education in the High Schools of Massachusetts.'' Yale. Hill.

61. Bussard, Paul. ''The Role of the Missal in Religious Education.'' Catholic University. Kirsch.

62. Butterfield, Oliver M. "Attitudes and Interests of Adolescents in the Field of Social Hygiene." Columbia. Jersild.
63. Carli, Armando R. "A Survey and Analysis of the Content and Methods of Teaching the First Course in English Literature in Colleges of Liberal Arts." Buffalo.
64. Carlson, Vernon C. "The Educational Theories of Ruskin." Johns Hopkins. Bamberger.
65. Carmichael, V. H. "Learning Difficulties in Gregg Shorthand." Pittsburgh. Lessenberry.
66. Carre, Paul. "An Historical Account of the Content and Objectives of Geography in American Schools—Public and Private." Johns Hopkins. Bamberger.
67. Carron, Lionel V. "Neo-scholastic Philosophy and Its Bearing Upon Education." Western Reserve.
68. Cavan, J. T. "The Part of the Cost of Higher Education Paid by the Student." Chicago.
69. Chalabi, Abd-ul-Jabbar A. H. "Interrelationships of Land Rural Reconstruction in Iraq." Columbia. Brunner.
70. Chi, Pan-Lin. "Reliability and Validity of the University Elementary School Personality Scale." Chicago.
71. Clare, Victor G. "The School as the Coördinating Centre of the Educational Agencies in the Small Communities of Pennsylvania." New York.
72. Clark, Alice Beula. "A History of Elementary Education in Oklahoma from the Organization of the Territory to the Present Time." Columbia. Johnson.
73. Clark, Archie C. "The Implications for a Teacher Training Policy of the Student Personnel of the Minnesota State Teachers Colleges. Southern California. Weersing.
74. Clark, William A. "A Critical Study of the Treatment of National-Racial Groups in American School Textbooks." Yale. Loram.
75. Clarke, H. Harrison. "Status of Graduate Work in Physical Education in Universities of the United States." Syracuse.
76. Clement, Evelyn. "The Development, Present Status, and Direction of Teacher Training with Special Reference to California." California. Hart.
77. Clement, Ralph. "The Scientific Bases of Methods in Art Appreciation." Pittsburgh. Yoakam.
78. Coates, J. D. "The Organization and Administration of the Small High Schools in Kentucky." Colorado State College of Education. Wrinkle.
79. Coffman, David R. "Experimentalism and Christian Education: A Critical Examination of Some Current Theories of the Philosophy of Religious Education in the Light of Evangelical Christianity." New York.
80. Cohen, Morris. "Reading Habits of the Adult Blind." Columbia. Abbott.
81. Cole, Dorothy L. "A Critical Evaluation of the Function of Women Physical Education Teachers Who Teach in the Secondary Schools of Pennsylvania." New York.
82. Collins, Henrietta. "Private Secondary Education for Girls in the Middle Atlantic States." Pennsylvania. King.
83. Colson, Edna M. "An Evaluation of Provisions in Teacher-Training Curricula for Meeting the Prob-

lems of Bi-racialism." Columbia. Evenden.

84. Condray, B. F. "A Statistical Study of the Requirements and Work for the Degree of Doctor of Philosophy." Chicago.

85. Connole, Roger J. "The Concept of Integration in Present Day Curriculum Construction." Catholic University. Johnson.

86. Conner, Sarah A. "Nationalism in English, Canadian, and American History Textbooks." St. Louis University. McGucken.

87. Cook, Raymond M. "Study of the Acquisition of the Meaning of Words Through Their Context in the Sentence." Chicago.

88. Cooke, J. V. "The Function of Mathematics in the Junior College." Peabody.

89. Copp, Harold W. "Learning in Swimming and Diving." Michigan. Trow.

90. Cornell, Francis G. "The Legal Basis for Adult Education in American Schools." Columbia. Cyr.

91. Cornwell, Oliver K. "The Application of Basic Business Principles to Budget and Finance in Intercollegiate Athletics." Columbia. Brownell.

92. Cottrell, E. B. "Standards for the Selection of People to be Trained for Service in Health and Physical Education." Pittsburgh. Dambach.

93. Cox, Meredith J. "General Science on the College Level as Training for Teachers of High School Science." Peabody.

94. Coyle, Irvin F. "A Critical Survey of Reconstructed School Areas in Missouri." Missouri. Capps.

95. Crespi, Alberta. "The Legal Status of Catholic Schools." Fordham. Cronin.

96. Cressman, E. W. "A Study of the Leisure-Time Activities of Pupils in the Paul Jones Junior High School of Philadelphia." Penn State. Peters.

97. Crisp, Blanche. "An Organismic Treatment of Secondary Geometry." Peabody.

98. Cross, A. J. Foy. "The Success of Pupils in Supervised Correspondence Study Courses at Various Levels of Mental and Reading Ability." Nebraska.

99. Crowell, Victor L. "An Analysis of the Specific Attitudes and Skills Involved in the Scientific Method and Their Treatment in High School Science Texts." Rutgers. LaPoe.

100. Cunningham, Isabelle. "The Value of Museum Materials in the Elementary School as an Aid in Teaching Fourth Grade Geography." New York.

101. Curtis, Lera B. "The Critical Evaluation of the Physical Education Program in the Rural Schools of Michigan." New York.

102. Curtis, Martha. "A Study of General Science Materials and Teaching Methods of Certain Eastern Woodland Indians in Relation to the Problems of Present General Science Teaching." Cornell. Palmer.

103. Dale, George A. "Some Psychological, Emotional, and Educational Correlates of School Maladjustment." Iowa. Knight.

104. Dalton, Frank. "The Development of Industrial Education in Michigan." Michigan. Myers.

105. Dahle, Casper O. "Study of Pupil Performance in Long Division." Iowa. Knight.

106. Dailard, R. C. "A Model Twelve-Grade School Plant." Nebraska.
107. Davies, Joseph E. "A Determination of Economic Problems and Generalizations Basic to the Development of Curriculum Materials Dealing with 'Housing'." Columbia. Bruner.
108. Davis, Earl. "The Development of State Subsidized Teacher Training Institutions in Massachusetts, New York, and Pennsylvania." Pittsburgh. Nietz.
109. Davis, Warren C. "The Philosophical Element in a Technical Program: A Study of the Philosophy Course at Rochester Mechanics Institute." Buffalo.
110. Dawes, Charles. "Standards of Speech and Pronunciation Among College Students." Temple. Owen.
111. Dawson, Mildred A. "Proposed Language-Composition Textbook for Either Grade Three or Four." New York.
112. Day, Leah. "Educational Opportunities in Primary Grades of One-Room Schools." Syracuse.
113. Dean, C. D. "The Predictive Value of the Seashore Tests of Musical Talent in the Teachers College." Colorado State College of Education. Heilman.
114. De Groot, Dudley. "History of Physical Education in California." Stanford. Neilson.
115. Desing, Minerva. "Relationship Between Certain Teacher Traits and Pupil Achievement." Pennsylvania. King.
116. Dewey, Henry E. "The History of the Administration of the Public Schools of Chicago." Chicago.
117. Dietrick, Glenn. "The Cost of Instruction in Secondary-School Subjects in Fourth-Class Districts." Temple. Owen.
118. Dimmick, E. A. "The Effects of a Supervisory Reorganization of a School on Children's Progress." Pittsburgh. Yoakam.
119. Donnely, Clifford V. "Pupil Participation in School Administration." Texas. Ayer.
120. Dossick, J. J. "A Study of Education Among the Ancient Aztecs at the Height of their Civilization During the 15th Century A. D." Harvard. Ulich.
121. Douglass, L. N. "A Study of the Health Factor in Teaching Success." Wisconsin. Barr.
122. Drake, Bernard W. "A Study of the Trends and Tendencies in School Bonding Practices in New York State." Columbia. Engelhardt.
123. Drazin, Nathan. "Talmudic Education." Johns Hopkins. Bamberger.
124. Dressler, David. "Burlesque as a Cultural Phenomenon." New York.
125. DuBois, Goddard. "Physical Education in Germany Since the World War." Columbia. Williams.
126. Duck, W. O. "Judicial Interpretations of the Power of School Boards in the Expenditure of Funds for Current Expense Purposes." Pittsburgh. Yeager.
127. Dunklin, Howard T. "The Prevention of Reading Difficulty by Early Diagnosis of Handicaps and Adjusted Instruction." Columbia. Gates.
128. Dunsmoor, C. C. "The Homeroom as a Guidance Agency in Secondary Schools: A Critical Analysis." Harvard. Brewer.
129. Eberhart, Wilfred. "The Teaching of Functional Grammar in the Secondary School." Ohio State. Seely.
130. Edmund, Willis H. "Recreation in Industry." Temple. Skinner.
131. Efron, Alexander. "The Teaching

of Secondary School Science in the United States, France, and Russia." Columbia. Powers.

132. Ehrensberger, Ray. "Problems in Gestalt Educational Psychology." Syracuse.

133. Eicher, J. A. "The Vocabularies of Social Studies." Pittsburgh. Yoakam.

134. Elliott, Catherine. "The Gradation of Reading Materials." Pittsburgh. Yoakam.

135. Ellis, Fendall R. "Survey of Out-of-School Youth in Virginia." Virginia.

136. Emry, June. "Potentialities of Geography for General Education." Oregon. Leighton.

137. Entwisle, Thomas. "Economies Effected Since 1929 by School Districts of the Fourth Class." Temple. Owen.

138. Etter, H. C. "The Rural High Schools in British Columbia with Special Consideration of Curriculum Variations." Columbia. Brunner.

139. Falk, Philip. "Repetition and Retention of Ability to Spell." Wisconsin. Fowlkes.

140. Faris, T. N. "The Severance Tax in the State of Louisiana." Peabody.

141. Farrar, Joe. "The Development of Public Secondary Education in Louisiana." Peabody.

142. Faulkner, Donald. "The Development and Conflict of Principles of Higher Educational Administration." Ohio State. Klein.

143. Feldman, Estelle E. "School Adjustment of Junior High School Pupils Whose E.Q. Is Below 85." Yale. Tilton.

144. Fenstermacher, V. H. "Tuition Charges in Secondary Schools of Pennsylvania and Other States." Temple. Owen.

145. Field, Elmer. "Economies Effected Since 1929 by School Districts of Population of 5,000 to 20,000." Temple. Owen.

146. Fisher, Charles A. "Guidance of Candidates for Teaching Positions in the Middle States and Maryland." Temple. Kuehner.

147. Fisk, McKee. "The Municipal Junior College." Yale. Hill.

148. Fitch, Earl Y. "The Factors Basal to the Determination of Agricultural Syllabi for the Scientific Regional Areas of Arkansas." Cornnell. Stewart.

149. Fleming, J. W. "A Study of the Training and Placement Records of Boys from the C. B. Connelley Trade School to Determine What Factors Have Prognostic Value in Selecting Entrants." Pittsburgh. Goldberger.

150. Floyd, John C. "The Selection of Trainees in Agricultural Education as Determined by Early Background, Training, Experience, and Other Characteristics." Missouri. Dickinson.

151. Flynn, Mary B. "High School Grade Progress in English." Fordham. Cronin.

152. Fogler, Sigmund. "Specific Elements in Developing Poetry Appreciation Among High School Students." New York.

153. Foster, Jr., Charles R. "American Newspaper Editorials on Education." Harvard. Holmes.

154. Fox, George D. "Colonial School Masters (1635-1775)." Johns Hopkins. Bamberger.

155. Fox, J. Harold. "Centralizing Tendencies in Secondary Education, Province of Ontario." Harvard. Spaulding.

156. Frank, Benjamin. "The Relation of Strength of Perseverative Tendency to Recidivism." New York.
157. Fudge, Helen. "Girls' Clubs in the United States—Their Development and Present Status." Pennsylvania. King.
158. Furber, Elizabeth F. "Investigation of Attributes Which Facilitate or Retard Acquisition of Skill in Dancing." Columbia. Williams.
159. Galligan, E. E. "A Critical Analysis of Certain Current Practices in Athletics for Men in State Teachers Colleges." New York.
160. Gentry, John R. "The Cumulative Effect of Interpolated Successive Rest Periods in Learning." Columbia. Lorge.
161. Gerveny, George H. "An Examination of the Vernon L. Parington Method of Literary Criticism." New York.
162. Gilbert, L. F. "Origin and Development of Public School Control in Pennsylvania." Pittsburgh. Yeager.
163. Glasgow, M. W. "Legal Problems Affecting Taxation for Public Schools in Oklahoma." Oklahoma.
164. Gleason, George. "Protestant Church Group Activities for Young Married People." Columbia. Johnson.
165. Glover, O. K. "Character Education in the Grade School." Washington.
166. Goebel, Edmund J. "A Study of Catholic Secondary Education During the Colonial Period." Catholic University. Drobka.
167. Goetsch, Helen B. "Inequality of Educational Opportunity in Milwaukee." Columbia. Clark.
168. Goldstein, Harry. "The Hearing Span: Its Relation to Reading Rate and Comprehension." Columbia. Gates.
169. Gordon, Eva L. "A Study of Certain Types of Nature Literature in Terms of Usefulness in Modern Educational Practice." Cornell. Palmer.
170. Gore, George W., Jr. "The Professional Preparation of Negro Public School Teachers in Tennessee." Columbia. Evenden.
171. Graves, Marion C. "A Decade of Controversy in American Institutions of Higher Learning." Columbia. O'Rear.
172. Greany, Ellen M. "German Public Education Under the Republic." Boston. Davis.
173. Greene, Ellen F. "Suggestions for Adaptation of Elementary Curricula with Reference to Some Selected Factors in Southern Negro Life." Columbia. McGaughy.
174. Greene, Robert A. "A Study of Educational Values Involved in the Presentation of Classroom Dramatics by Children." Cornell. Palmer.
175. Gregg, Howard. "Status of Negro Public Secondary School Pupils." Pennsylvania. Grizzell.
176. Griffey, Carl H. "School Elections in the State of New York." Columbia. Engelhardt.
177. Grime, Herschel E. "The Relationship Between the Ability to Solve Originals in Plane Geometry and Scores on Various Tests." Western Reserve.
178. Groth, Lester F. "An Historical and Critical Study of Standardized Tests in German." Wisconsin. Rösler.
179. Guenther, Henry W. "The Constitutional and Legal Basis of Public School Administration in Oklahoma." Chicago.
180. Gustafson, Elton T. "An Experi-

mental Investigation of the Relationship Between the Latent Time of the Pupillary Light Reflex and Various Mental Measurements.'' New York.

181. Haggard, William W. ''The Legal Basis of School Organization and Administration in Illinois.'' Chicago.

182. Haggarty, Helen. ''The Nature and Extent of the Professional Training of Prospective Women Teachers of Physical Education.'' Columbia. Williams.

183. Hainfeld, Charles F. ''Teacher's Manual for Secretarial Practice, and Secretarial Practice.'' New York.

184. Hait, Kenneth B. ''An Analytical Study of the Generalizations of Young Adults.'' Peabody.

185. Hamilton, H. C. ''An Experimental Study of Factors Conditioning the Effectiveness of College Orientation Courses.'' Cincinnati. Hendrickson.

186. Hamrick, Clarence R. ''Transportation of Pupils at Public Expense.'' Virginia.

187. Hanson, Warren A. ''A Study of School Operation Costs in the State of Connecticut.'' Yale. Hill.

188. Harby, Sam F. ''The Educational Program in CCC Camps.'' Columbia. Cyr.

189. Harder, Keith C. ''The Relative Efficiency of the 'Together' and 'Separate' Methods of Teaching Homonyms.'' Iowa. Horn.

190. Harrington, Wells. ''The Possibilities and Limitations of Organized Education in Occupational Planning as Illustrated by Two Occupations.'' Columbia. Clark.

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